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ABSTRACT

This handbook introduces some fundamental ideas on designing, implementing, and facilitating a distance learning course. It offers specific strategies for topics ranging from choosing delivery technologies to encouraging collaboration among scattered distance-learning students to testing and other evaluation methodologies. The book is broken down into seven chapters. Chapter 1 discusses strategies for developing an effective distance learning experience. Chapter 2 covers new learning environments and instructional technologies. Chapter 3 offers information on advantages and limitations of different distance education technologies. Chapter 4 provides an introductory discussion of communication issues related to teaching at a distance as well as of factors related to enhancing interaction in distance learning environments. Chapter 5 covers a basic design structure adapted to the needs of instructors working with students at a distance. Chapter 6 is organized around testing and assessment in distance learning. Chapter 7 offers a profile of the distance learning model of one innovative and experienced community college. Contains 51 references, a list of related Web sites, and a glossary of terms. (AMA)

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TEACHING AT A DISTANCE

A HANDBOOK FOR INSTRUCTORS

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Teaching At A Distance

A Handbook for Instructors

League for Innovation in the Community College
Archipelago Productions
1999

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A handbook is by definition both resource and reference guide. As a guide for distance learning instructors, we expect that this handbook will be a starting point for some, while for others it may serve as a simple review. In either case, we hope that it will provide you with valuable information.

The pages that follow will introduce some fundamental ideas on designing, implementing, and facilitating a distance learning course. The documentation of these ideas is the result of a collaborative effort involving a group of well-known and well-respected educators, with a collective experience of more than 75 years in distance and distributed education.

The Teaching at a Distance handbook is intended to serve as a tool for preparing effective distance learning experiences for your students. It offers specific strategies for tackling topics ranging from choosing delivery technologies to encouraging collaboration among scattered distance learning students to testing and other evaluation methodologies. However, it is by no means exhaustive. As you build your own distance learning course, you will no doubt use some of our suggestions while discarding others, modify others to fit your own specific needs, and in some cases create your own entirely new way of doing things.

Finally, it is our hope that this guide will be a useful tool to support you in bringing quality content and flexible, interactive learning opportunities to best serve the growing population of anywhere, anytime learners.

Archipelago Productions

Fundamentals of Designing a Distance Learning Course

Strategies for Developing an Effective Distance Learning Experience

Darcy Hardy, The University of Texas System

Chapter Overview

This chapter provides a basic course design structure adapted to the needs of instructors working with students at a distance. It also focuses on strategic issues that are particularly important for designing effective learning experiences. The following sections are included:

Fundamental Questions
Strategies for Success
Getting Started
Summary: Guiding Principles

Introduction

Designing a distance learning course should be both exciting and fun. As instructors, we strive to develop a learning environment for all students that provides them with a strong, quality experience and which establishes an opportunity for them to succeed.

As we design distance or distributed learning course environments, we should first focus on the fundamental questions we would ask in designing any course. We start with the same basic questions because the outcome we seek–a quality learning experience for our students–is the same. As we formulate the answers, however, it is important to consider some of the special needs and issues which students working in a distributed learning environment face.

This chapter provides answers to fundamental design questions in the context of distance learning, as well as strategies for ensuring that students can succeed in this learning environment. Special attention is given to issues of clarity, communication, planning, technology, and evaluation, issues that are discussed further in subsequent chapters.

Fundamental Questions

Good course design requires that you ask these fundamental questions:

1. Who is your primary student group or audience?
2. What do you want students to learn?
3. Why will students enroll in this course?
4. How are you planning to deliver the course?
5. What academic resources are needed for student success?
6. What outcomes will indicate student success?

Asking the wrong questions, in the wrong order, may lead to the wrong solutions. Surprisingly, a number of instructors seem to start at question four, with a discussion of the technology. This approach frequently leads to problems and discontent. In addition, with distance education, the design process is iterative. Answers to early questions may be revised as later ones are answered. This is desirable, not problematic, and should be seen as a normal process rather than a setback.

This chapter focuses on some possible answers as you plan a distance learning course. The answers will vary depending on several factors: the subject matter involved; the type of students; the level and availability of the materials; and the technology available to instructors and students.

There are no right answers, but many options. The solutions may not be ones we have traditionally used in the past. However, the process is fundamental and will apply regardless of the answers that eventually emerge.

Question One: **WHO IS YOUR PRIMARY STUDENT GROUP OR AUDIENCE?**

Know who your students are.

As with on-campus students, distance learning students are heterogeneous. They vary in age from 18 to 80+ years old, they may live anywhere, and they have diverse work and educational backgrounds. Some may have a lot of on-the-job experience, while others are just starting out in a particular career or preparing for a new one. Some students may be studying in English, even though it is not their first language, and have little understanding of U.S. customs and practices, educational as well as cultural. Distance learning students represent an array of abilities, goals, and needs that can challenge even seasoned instructors. The important first step is to define your audience and then build the course in a way that addresses individual needs and expectations.

Adult students tend to be more self-motivated than younger students, and many distance learning students have specific goals and strong career needs.

The primary concerns for adult students taking distance learning courses are time and flexibility. Students at a distance are often interested in integrating their educational activities with their personal and professional obligations. Because of heavy schedules, these students are interested in time flexibility. They may be taking only one course and may be more motivated to succeed in order to achieve their personal goals and career objectives.

A typical student.

Alice is 37 years old, single, with two children, ages 5 and 7. Alice needs a bachelor's degree in order to advance in her state job, where she hopes to become a manager. She is currently a data entry clerk. She coaches a soccer team and gardens in her spare time. She received her A.S. degree from a community college 17 years ago.

Another typical student.

George, age 45, is a sergeant in the city police force. He is married with one daughter, age 12. Because he works unpredictable hours, George needs a flexible schedule. Writing scares him, although he knows he needs to improve. He is the assistant basketball coach at the local middle school and is in the process of preparing to hike the Adirondacks. He has some college credits from the local community college, but no degree yet. The nearest four-year state university or college is 45 miles away.

Student information may be collected in a variety of ways.

Knowing more about your students is important for their success and your effective teaching of the course. You can collect the information several ways; however, the questions you ask should include ones specifically useful to the learning objectives of the course. Some possibilities include:

- a "cafe" or "student lounge" where students introduce themselves and can post pictures;
- a structured questionnaire, either on- or off-line. The results of the questionnaire may or may not be shared with the others in the class, depending on the nature and length of the questions;
- a personal telephone conversation with each student at the beginning of the class to speak with everyone and to ask follow-up questions, where appropriate; and
- reporting on an interview with another class member, to introduce him or her to the group, that can be done online or on the telephone, with a synopsis posted for all.

Draw on students' experiences as the class progresses.

If you have projects in which students are paired or work in small groups, you may want to structure the subgroups so that people who have a range of backgrounds can work together, a workplace model which students may face later on the job. If you are including an exercise or case in which people assume roles, you might want to be sure that students play a role different from the one that they usually assume at work.

Question Two: **WHAT DO YOU WANT STUDENTS TO LEARN?**

Identify clear overall objectives or learning outcomes and share these with students up-front.

Objectives for a distance learning course may be similar or identical to those for a traditional classroom experience-or they may vary. For example, the primary purpose may be:

- to offer Introductory Marketing online to students who are enrolled for 15 weeks; or
- to offer online modules focused on particular writers, such as Bronte, or on certain eras such as post-Civil War, available on demand to be mixed and matched, depending on student or instructors interests, for a flexible but structured learning experience.

Some people answer this question by stating what students will be able to do when they finish the course. For example, in those courses that have strong skill components such as Introductory Accounting, instructors will phrase the overall goals in terms of students' ability to analyze and report accounting information. These are outcomes that are somewhat particular, but not exceptionally specific.

Identify specific objectives or learning outcomes and share these with students up-front.
Here you need to include items which span the course, but which are still important to mastering the material. These can be grouped into four categories:

- content
- workplace skills
- cross-disciplinary skills
- prerequisite review concepts

Content objectives or learning outcomes relate to the specifics that you expect students to learn as they work through the course concepts.
Content objectives and learning outcomes need to be action-oriented and clearly tied to learning activities and exercises, and to the evaluation and assessment activities included in your distance learning course. Objectives relating to workplace skills are becoming increasingly important to students (who want to be employed someday) and employers (who seek to hire our students). For example, it may be extremely important that students be able to communicate effectively, develop virtual team skills, make effective, organized presentations, analyze unfamiliar situations, or compare and contrast ideas.

In addition, students will find many and varied resources on the Web, but frequently have little ability to evaluate the information. They have neither a framework against which to bounce the information they find nor a set of criteria to use in evaluating the sources of that information. Thus, some instructors are finding it valuable to have a link to a separate module on evaluating information (some college libraries produce them) or to develop an integrated lesson that addresses this issue within the specific context of the course.

Distance learning students respond well to integrated learning, so many instructors are developing cross-disciplinary objectives.
Because students need to understand the links between disciplines and to apply information that is gathered from a range of academic areas, instructors are developing objectives that explicitly address this component. In addition, adult students, who are the primary participants in distance education, may have difficulty seeing the disciplinary ideas in isolation: they need and value the interdisciplinary nature of some ideas. Because most of life is cross-disciplinary, students often find useful references from their own experiences that enhance their learning.

The heterogeneity of backgrounds and preparation of students may necessitate objectives related to review concepts.
Because work and educational backgrounds vary greatly among students, and because much of their formal education may have been a long time ago, many distance learning students will need some help with review materials. Instructors have found multiple ways to deal with this, such as self-paced exercises and readings, as well as extra assessments, support services, Frequently Asked Questions (FAQs), and e-mail to student tutors that can be delivered synchronously and/or asynchronously.

Question Three: **WHY WILL STUDENTS ENROLL IN THIS COURSE?**

Students enroll in distance courses primarily for one of these reasons:

- access and time flexibility;
- opportunity to collaborate with students who live far apart;
- opportunity to collaborate with students of diverse backgrounds for greater learning.

Access and time flexibility are the most frequent reasons for students to choose distance education.

Students seek distance learning alternatives when they live too far away from a school offering the academic program they need to meet their goals. Geographic access was a motivating factor for George, the student described earlier, as he had no local options and heavy time constraints. An example of academic access occurs with the less frequently taught languages. Instructors are making courses on such languages available across states, or within large systems or consortia of schools, so that they can continue to offer courses that may not be in high demand on any one campus.

Distance education allows students who are distantly located to study together.

Colleges are partnering with other institutions at a distance, such as ones in the U.S. and Japan, to offer courses. In these partnership courses, students begin to understand the challenges faced in distant locations and can work cooperatively to solve problems they may face once they enter the workforce.

Distance education permits students with a range of backgrounds to complete the same learning objectives.

The opportunity to offer modules that can be mixed and matched, depending on the student background or work environment, may affect the way that you answer this question. For example, if some students have strong health care backgrounds, while others come from a manufacturing workplace, a course on quality improvement might include specific applied case modules relevant to each sector. For these students, the application aspect of the course needs to be designed differently. Such choices can be easily created and accessed via the Web.

Question Four: **HOW ARE YOU PLANNING TO DELIVER THE COURSE?**

Consider what types of learning activities are needed at a distance so students can accomplish the objectives you have identified.

Here are some options:

- teamwork–collaborative activity such as projects, tests, demonstrations, joint papers, or peer assessment of work
- communication–peer to peer, student to class, student to instructors, student to virtual guest or other expert
- independent study
- resource development
- resource sharing
- creative problem solving
- application of learning to new situations–interactive case studies, individually or as a group member, simulations or virtual labs, on-site observation
- assessment–to assign grades, to determine learning outcomes, or for self-assessment

The choices will be related to what students need to accomplish and what delivery options are available.

There are two questions that must be considered in planning for a distance learning course: Will the course be delivered synchronously or asynchronously? What will be the mode of delivery? These must be linked, but still provide quite an array of options. Depending on other choices made by the institution, some options might not be available. However, using a mix of technologies is common and often proves to be most effective in meeting the learning objectives.

Synchronous options require that students get together either virtually or in the same location at the same time.

Chat groups and satellite or two-way video are two examples of synchronous delivery. While these are useful for some types of learning, they are also more restrictive for students and will not fit some students' need for flexibility related to family and job responsibilities. Typical choices that need to be made are:

- Will students get together weekly on a particular night or at a particular time via satellite or other such technology?
- Will students be expected to participate in chat sessions at a particular time?
- Will students have weekend residencies at the beginning and end, with distance learning in between?
- Will a specific number of telephone contacts be required, with no face-to-face meetings?

Asynchronous options provide greater flexibility and independence for the student, a feature very attractive to many adult learners.

Asynchronous options are used at a time selected by the student, and there is no need for others to be working on the same activity at the same time. Some examples include:

- threaded discussion which is categorized by topics or other useful content divisions, selected by instructors or by students under instructor guidance
- electronic bulletin boards to post FAQs (Frequently Asked Questions) and other information for the entire class
- e-mail, with mailing lists developed for the entire class and any teams or workgroups which are appropriate to the learning activities
- voice mail
- print materials
- CD-ROMs
- interactive assignments on the Web, with results submitted automatically
- faxes

Effective course delivery will provide time for content, communication, and assessment.

The pivotal question becomes what works effectively so that students master the necessary objectives. For many students the need to be available at a set time is a major constraint. Their work and home lives preclude participation in a course that has a high synchronous component. When teaching students who live in a range of time zones, synchronous delivery is quite problematic. For other students, there are academic concepts that are difficult for them to master in an asynchronous environment, and they seek an opportunity to study with others at the same time.

The question is not, "What is best?" The question is "What works most effectively for student learning?" More suggestions on communication strategies are available in Chapter Four. Chapter Three also provides useful information regarding the advantages and disadvantages of both synchronous and asynchronous learning technologies. Your institution may support several options, and you should consider these within the context of the learning objectives and evaluation measures you plan to include in your course.

Question Five: **WHAT ACADEMIC RESOURCES ARE NEEDED FOR STUDENT SUCCESS?**

Select resources that match your learning objectives and that provide a range of learning options for students.
Choose resources that will be tied to specific learning objectives and outcomes, and be sure that students know up-front how to obtain these resources.

Some resources that are easily found on campus will provide a significant challenge for delivery at a distance.
Some distance learning students will have access to a library in their local community. Some distance learning students will be located quite a distance from a good library. Other resources are accessible from the Web. Some resources such as videotapes, audiotapes, and CD-ROMs can be shipped to distance learning students.

Be sure that students know up-front what technical requirements are needed.
Some Web-based resources will have particular hardware or software requirements such as special plug-ins or other technical support. It is imperative that students understand what minimum hardware is needed and that they know how to access technical support centers (either on campus or through a commercial vendor) at or before the start of your course.

Because of the wide range of resources, distance learning students frequently need help evaluating the resources they find.
The greatest challenge is the situation where students are located in many places with a wide range of resources. Students are quite talented at identifying resources; they are less capable in assessing the value of what they find. If your institution has a tutorial or materials that will assist students in resource evaluation, try to include this information with your course materials. You can provide print-based information, you can post tutorials and other self-directed modules on the Web, or you can provide audio or video materials which students can use as needed. Do not assume that all students will know how to make these assessments without your assistance.

Question Six: **WHAT OUTCOMES WILL INDICATE STUDENT SUCCESS?**

Chapter Six discusses evaluation in the distance learning environment. However, here are some basics to keep in mind as you begin planning your course.

The actual types of outcomes that you plan will relate again to the objectives you establish.
Some outcomes will be cognitive, related to the content of the course. Other outcomes will be attitudinal, indicating how students feel about different aspects of their learning. Finally, for some courses, the desired outcomes will be measurable behavioral achievements. Since, for some students, working at a distance will include personal challenges, assessments should be relevant to actual learning outcomes, and not to whether they are a success at taking a distance learning course.

Students taking a distance learning course need to know clearly and specifically what constitutes successful outcomes.

When students cannot easily communicate with you or others in the class–because they do not know you or each other or because they are unsure about how to share their work using the technology–it is important to be clear at the beginning about your expectations. Some instructors choose to specify expected outcomes in terms of student accomplishment. Others will share with students certain characteristics that indicate success. In either case, this information must be shared with students before they begin their coursework.

In addition, when students are working independently at their own time and pace, some will move through certain parts of the course more easily and take longer with other sections. Thus, although you will set a pattern or deadlines for submission of assignments, frequently there is a greater need for flexibility with distance education courses. Students need to be able to move forward at their own pace and know as they approach each lesson what is expected of them.

Be clear about what to do, and how to do it, up-front.

Definitions of success require more detailed description on the Web than you might think necessary. For example, you might need to describe the terms "compare" and "contrast" before actually telling students what it will mean to successfully apply these terms. As mentioned earlier, it is desirable to make certain that if students are having difficulty with an assignment, that the difficulty results from trouble understanding the concepts, and not from trouble understanding the assigned tasks.

Strategies for Success

After answering the questions above, you should have a good idea of what you want to do and why you are doing it. Be sure to think about specific issues that you need to address to make sure your course is designed to foster success for students. These strategies fall into four categories: **clarity**, **communication**, **planning**, and **evaluation**. More specific ideas on several of these concepts are provided in later chapters of this handbook.

Clarity

As noted, it is vital that all aspects of the course are clear–your directions, your expectations, your objectives, your requirements, your timeline, and your criteria for success. Confusion will lead to problems, which needlessly increases the need for communication in more traditional modes.

For example, while good instructors all have objectives, some of which are implicit, it is particularly important within the context of distance education to be clear with your students about what it is you want them to achieve. If the objectives are not clear, students may have significantly more difficulty learning, not because of their inability to do the work, but because they must work harder just to communicate using technologies with which they may not be familiar or comfortable.

Initial clarity on all topics will reduce the number of follow-up explanations that are needed.

Students working at a distance may not be able to ask questions during "working hours" and will not see you three times a week after class. Thus they may move forward doing little of what you intended, because of the asynchronous and, for some, unfamiliar nature of the communication. Students in distance learning courses come to know each other more slowly than in the traditional classroom environment, and therefore, may not rely on one another to sort out their confusion. Thus, it is important for you to channel student energies into learning for the course, not into sorting out your requirements.

In addition to your objectives and directions, your requirements, timeline, and criteria for evaluation must be clear. Be sure students understand the instructions and the terms which you use.

If you have ever encountered confusion regarding concepts or instructions in the traditional classroom version of your course, it is certain that students at a distance will also experience confusion when they encounter them. However, for these students, you need to anticipate the problem and clarify the ideas up front.

Use FAQs to reduce confusion.

Structure your course so that you have a place to publicly reduce any confusion that may arise. Some instructors use FAQs (Frequently Asked Questions) for this purpose. They have a location on their Web site or in their threaded discussion categories where new information can be added and accessed by the entire group. Some commercial vendors offer content/topic specific FAQs for immediate student reference. Other instructors use bulletin board or listserv technologies to send explanations to everyone whenever they detect a point of possible confusion. You may prefer the FAQ method because it can be reused and built upon each term. After you have taught a given course online, you will be able to anticipate where students will have questions and reduce the number of times you must answer a specific question by providing clear information early on.

If particular equipment is needed, be sure that such needs are clearly spelled out before registration. If particular prerequisites are required, be sure this information is available ahead of time. (This may not be an issue, as most colleges' systems will not allow students to enroll if they have not met prerequisites.) Where specific technology requirements are important for a course, such as owning a VCR or a computer with specific capabilities (e.g., a CD-ROM drive), include such information in the course announcement or bulletin. Then students can also make informed decisions based on their own access to the technology needed for the course.

Whenever possible, share the assignments and syllabus with the students prior to registration. Many students taking distance learning courses are adults with many demands in their lives. They are concerned about doing well in your course, but they are not always able to respond to last minute requests. The more information you can provide, the better they will be able to plan their time and resources. Likewise, be prepared to stay ahead of ambitious, motivated students by preparing well in advance of the scheduled topic coverage.

Provide students with hints for success.

Remember that working at a distance is new for many students. In addition, many distance learning students may not have access to campus-based student support structures. Provide as many guidelines for being a successful distance learning student as you can collect.

For example, let students know early that you have seen other students who have had some difficulty controlling their time for study, especially when it conflicts with their family and job requirements. Offer them ideas. You might suggest that they consider designating a specific place to study which is solely theirs. For example, the kitchen table might seem like a good place at first, but it needs to be cleared frequently. Taking their studying seriously includes designating a specific and special place for them to collect study materials, books, and computer. Provide a calendar with designations for study and library time.

While some of these hints may seem like common sense, remember that these students may be experiencing taking a college course for the first time in a long while, and it may be their first ever distance course. In addition, they may not be accustomed to having family, neighbors, and colleagues as competitors for their time and space.

Pay special attention to hints and additional information that deal with the use of technology or communication processes required for student success in your course, and help students organize themselves. If successful, they will be more likely to complete your course on time and with good work.

Communication

Stay in touch with the group as a whole and with each individual student.
Students who keep in touch are more likely to be successful. Build situations requiring communication and be clear about your expectations of students. For example, if you want students to participate on a regular basis, say so. Then also define what you believe is a regular basis: twice a week, at least once per module, etc.

Let students know up-front how often and how quickly you will respond.
Let students know if you plan to check your e-mail everyday. Then students will know to expect a response of some sort within twenty-four hours. Students who send you an e-mail on Saturday night need to know whether you work on Sundays, or whether they should expect to wait until Monday for a response. Be sure to acknowledge messages or receipt of papers even if you know you will need to respond in greater detail later. Some instructors have established an automatic message for the receipt of papers which tells students that the paper was received. Setting such expectations for students will reduce the amount of uncertainty they experience.

Build interaction.
Interaction with information and with other people leads to greater learning. Interactive opportunities can occur with course materials, with outside resources, with other students, with outside guests, and with the instructor. Use technology to foster these relationships for learning by building in opportunities for students to work together in small groups, in pairs, and, where feasible, as an entire class.

Use chat groups if you determine synchronous communication is desirable. You might also have an open chat session, analogous to virtual office hours, before a major assignment is due or on a weekly basis. Student use will vary, but they will be pleased to know that the opportunity to talk with you is available.

Threaded discussion is an example of an asynchronous method for guiding class discussions. It can be organized around study questions, major course topics, assigned readings, or a pervasive course theme. In addition, many instructors include a virtual "cafe" or "student lounge" where students can talk about topics or ideas not directly related to the course, providing an opportunity for students to get to know each other.

Chapter Four explores different types of communication and interaction in greater detail.

Planning

It is not possible to "wing it" and be successful.
Spend a lot of time planning what will happen in each lesson and in each section, regardless of delivery mode. The less familiar the distance learning environment to faculty and students, the more preparation is required.

Plan for a variation in the quantity and quality of resources to which students will have access.
Almost certain is the fact that there will be considerable variation in the quantity and quality of resources to which your students have access. As you design your course, consider alternative

resources for students. Work with your institution to provide required and alternative resources for distance learning students. Be sure that Web links and other Web-based resources are active.

Include information about how to succeed with the technology.
Remember that many students have never used a chat group or a threaded discussion. You need to include information about how to tag their ideas using preset categories which relate to the learning concepts, and how to organize their thoughts so that they do not run on for too many screens. Set limits for their interaction.

Develop content in modules.
As much as possible, design your learning environment in small "bites" or pieces. Students working at a distance, especially busy students, will frequently study in smaller time blocks and will appreciate the modular structure. In addition, if you have opportunities for students to conduct self-assessments, having the material in a modular format will facilitate self-testing.

Employ strategies that save you time.
Your time should be spent as much as possible working on issues related to student learning. Instructors frequently comment that distance learning students take up more of their time than those who are in a classroom. Part of the time demand occurs because distance learning students do not know each other. Consequently, you are the only person involved in the class that they know. Some strategies that will help with your time allocation include:

- Anticipate questions, post FAQs, and direct students there before they raise questions.
- Consider two e-mail addresses, one for students in your class and one for other work-related issues. Then you can deal with the course communication all at one time.
- Teach students to tag their e-mail so that you can easily determine the content. Also encourage them to use the numbers you have pre-assigned to questions or assignments. Be clear about this. With some e-mail programs, you can sort your messages and consider all communications about the same assignment, idea, or concern at the same time.
- Arrange for students to critique each others' work first. By using this strategy, you will get better papers that will take less time to grade. You can also use this strategy to teach your students editing skills, but you will need to provide clear, defined criteria.
- Hold virtual office hours using chat, which will allow quick answers and quick feedback so students do not go too far astray.
- Establish peer buddies so students have the opportunity to talk over the issues first among themselves, before coming to you. Such an arrangement also teaches collaborative working.
- Establish a student lounge in the threaded discussion so that people can post questions and get responses from classmates.

Evaluation

Provide students with multiple opportunities for assessment.
Include both self-assessment and instructor graded evaluations. Students respond well to learning how they are doing and where they need to spend more time. Technology allows you to link course content to specific learning outcomes that can be reviewed and practiced as often as necessary by students. With these learning exercises students can experience numerous attempts and get feedback on their success. Such activities mean that students will learn more and turn in final assignments that are better because they have worked through the difficult parts. In addition, students with different learning styles will be able to draw on their individual strengths to demonstrate what they have learned.

Include group as well as individual assessment opportunities.
Strategically, having students work together reduces the number of assignments you need to evaluate. It also incorporates workplace skills of teamwork and information sharing at a distance, which will be valuable later in students' careers. With clear criteria for assessment, students can develop good projects at a distance and can provide you with better work to evaluate.

Leverage the technology in the assessment process.
The Web and other technologies provide new ways for students to demonstrate their learning. Incorporate as many of these techniques as possible. For example, include survey responses from each student, then analyze the data to demonstrate particular points. Ask them to assume roles in a case study and analyze the case from that point of view. In addition, the use of audio and video files provides opportunities to use different methods of assessment, and are particularly useful in courses involving foreign languages.

Provide opportunities for students' creativity.
It is important in learning to include opportunities for students to be creative. These opportunities allow students to relate their learning effectively to their experience and local context. In addition, it is much more difficult to cheat when each assignment has a component that is specific to each student.

Evaluate the course progress frequently.
As noted in the introduction, designing a distance course is an iterative activity. Frequently evaluate how your course is going. Ask students and ask yourself. Make changes as your evaluation highlights areas that are not working as well as you expected.

Getting Started

Develop answers to the six questions that are posed at the beginning of this chapter.
Before attempting to make too many decisions about specific technology-related issues, systematically approach the planning by formulating tentative answers to the questions. While your responses will change as the planning proceeds, at least make some initial choices.

Develop sections of your course or modules.
Once you have sketched out the basic parameters via your answers to the six questions, begin to organize the content in sections and link these with likely readings, resources such as guests and Web sites, learning activities and assignments, and evaluation options. Build each section as a stand-alone module with links to the preceding and succeeding sections. Include ideas about communication, collaboration, and hints for success.

Make major resource choices that will support initial learning and information acquisition.
At the introductory level, you may decide that linkages to text can provide the information you desire about major topics. You then may structure your course with links to the text. For more advanced courses, much of the information acquisition will involve student identification via library resources and the Web. Be prepared for new and exciting resources that students will discover.

Determine whether you will need an integrating software package.
Some course development software is provided by software developers and publishers, and is integrated with course content. Some course development packages are sold as freestanding options such as WebCT or Lotus Learning Space, and you are responsible for providing the course content. Some institutions may have made a collegewide decision as to what course development software

they can support effectively. Once you have established what software will be used, you need to understand its requirements and capabilities. Spend some time experimenting with the software and talking to other instructors who have used it successfully.

If you are using synchronous technology, practice so that you either can manage the technology alone or are comfortable working with those who will be assisting you.
Two-way video frequently requires instructors to manage the onsite and remote cameras while conducting the class. If this is a new experience for you, take some time to practice before the first class so that you are able to direct the camera around the classroom easily. Satellite delivery may include technicians or people to answer the telephone calls from remote locations. Again, get to know these people and work with them in "dress rehearsals" so they are comfortable with your style and you know what types of verbal cues or lead-ins are needed to enable them to do their jobs well.

Investigate what learning activities are now available via technology that you have not been able to use previously.
The inclusion of technology in a distance setting may lead you to significantly different choices for student learning activities. CD-ROM or interactive Web activities and simulations are now easily incorporated into teaching. Links to library resources and other learning modules are easily established and may reduce your work.

Build your course.
Assemble, within the demands of the technology, the components of your course. Include the tools that fit the technology you are using. For example, if you are teaching a Web-based course, consider links for each lesson to other sites of interest. In addition, actively incorporate communication components. Communications among you and your students and among the students themselves that might develop naturally in a traditional classroom will not necessarily happen in a distance learning environment. You must explicitly plan and arrange for communication.

Plan to collect the data you will need to evaluate your course.
Chapter Six provides information regarding the types of evaluation data you may want to collect and some ideas about how to do this. Knowing how successful your course was will help as you revise and teach this course again.

Summary: Guiding Principles

- ***Focus on the fundamentals.*** Ask the same questions when designing a distance education course that you would ask before designing any course.
- ***Make sure all information is as clear as possible*** to reduce the number of follow-up explanations needed and to increase the likelihood of student success.
- ***Know who your students are*** so that you understand how they will be working and their motivation for taking this course. Collect additional information so that you and your students can understand one another's perspective and draw on each other's expertise as the class progresses.
- ***Develop your course content in modules*** and employ time-saving strategies, such as FAQs, separate e-mail addresses for students and other professional communication, and virtual office hours.
- ***Consider using a combination of synchronous and asynchronous strategies*** for content delivery, communication, and assessment. The pivotal question becomes what works effectively so that students master the necessary objectives.
- ***Whenever possible, incorporate audio and video files*** to demonstrate concepts that are not easily learned from the text.

- ***Use multiple methods of evaluation and evaluate frequently.*** Ask students and ask yourself. Make changes as your evaluation highlights areas that are not working as well as you expected.
- ***Include frequent opportunities for communication.*** These opportunities will significantly contribute to the likelihood that students will succeed.

Instructional Technologies-Part One Leveraging the Technology Menu

A Practical Primer for New Learning Environments

Don Foshee, Innovative Interactions, Inc.

Chapter Overview

Chapters Two and Three first provide an introduction to some of the tools that make up the "Instructional Technology Menu." The overriding intent in these chapters is to provide a guide through the growing maze of available tools, to clarify much of the confusion that surrounds them, and to simplify selection and application processes that will lead to an optimal mix of technologies for a wide range of learning objectives. Chapter Two also presents an appropriate introduction and foundation for Chapter Three, which goes into greater detail regarding the effective use of technology for instruction, pedagogical issues, and teaching dynamics.

Another goal of these chapters on instructional technology is to provide practical, common sense guidelines and principles to a wide range of readers–both novice and seasoned–without over-emphasizing a specific technology or methodology. This approach is based on the recognition that there is no one solution above all others and that technology provides a set of tools -no more, no less–to facilitate teaching and learning. Selection of the tool (or tools) should be based on the application at hand, driven by need, and must always answer the basic question: "What am I trying to accomplish?" Then, and only then, can decision-makers and planners evaluate technology options and match tools with instructional goals and pedagogy.

The following sections are included in this chapter:

The "Basics": A Telecommunications Primer
The "Menu": Ten Proven Technology Models
Lessons Learned
Basic Design and Environmental Considerations
Technology Is the Means, Not the End
Summary: Guiding Principles

Introduction

The integration of communications and information technologies into the mainstream of our educational institutions has been a reality for some time. In a little over two decades, we have gone from the most basic audio/visual media in schools, limited to overhead projectors, slides, 16mm film, or occasional viewing of pre-recorded PBS programs, to instructional delivery by way of a multitude of interactive technologies, to full degree programs available to students

thousands of miles apart who may never need to set foot on a traditional campus. Despite this remarkable transition, however, the acceptance, success, proliferation, and effective use of educational technologies have, by many accounts, fallen far short of expectations and potential.

While the telecommunications and information revolutions in this country are reshaping the way we live and work, their combined impact on our educational institutions and methodologies has been somewhat slower in coming, as has the embracing of the new tools they offer. The reasons are many, but certainly at the top of the list has been a low level of awareness on the part of practitioners–the users who must learn, plan, operate, administer, and teach in these new environments. Add to that the increasing confusion as technology options continue to proliferate, and the unfortunate result all too often is a situation in which content, applications, and pedagogical decisions are driven by the technologies themselves, rather than the other way around.

The "Basics": A Telecommunications Primer

Because instructors have widely differing levels of expertise and technical knowledge, it is essential to establish a technical foundation or common ground from which to move forward. This telecommunications "primer" approach, in the form of a general overview, is provided in the following section. For those more familiar with the nuts and bolts of technology and networks, or who already operate comfortably within these environments, a general browsing of this section may be all that is required. However, familiarity with the concepts and principles presented here can be of significant benefit to even the more seasoned practitioner.

In this era of technology dominance, and near-obsessive tendencies toward "cutting edge," it is important that users maintain perspective about the big picture. For well over thirty years, education and training have been facilitated through a wide range of electronically mediated methodologies that have evolved over time.

In the distance learning world, the technologies chosen are no better than the network used to link them together–i.e., to bridge the distances of space and time between teachers, trainers, learners, and the information they wish to share. Today's practitioner has an unprecedented number of connectivity possibilities and options for continuing to improve accessibility and decrease cost. Unfortunately, this growing list of choices can also make the

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selection process more confusing. This section intends to help instructors navigate through the maze of options by providing general information about prevailing network technologies, common technical jargon, bandwidth and data-rate considerations, advantages, disadvantages, and tradeoffs. As with considerations of system hardware and room configurations, careful evaluation and understanding of these factors is critical in planning and implementing a successful project.

Of particular importance is a clear understanding from the beginning that although initial expenditures in systems hardware, room peripherals, and network interface equipment are significant, they only represent the "front-end" portion of the investment. Network costs, on the other hand, represent a different investment altogether, and, as a major recurring operating expense, will typically account–along with personnel–for the biggest portion of expenditures incurred. From a purely cost perspective, the selection of an appropriate and efficient network strategy can often be the determining factor in the long-term financial viability of a project.

Architectural Considerations and Strategies–Dedicated vs. Public

As with the selection of appropriate technologies for education, choosing the right network architecture and services starts with a clear understanding of needs and a concise definition of objectives and applications. For example, if the intent is to share educational resources within a defined community or district (or even within a state), with a significant amount of control required, and with no real need for connectivity in or out of that defined service area, a private or dedicated network may be in order. The best examples of this scenario are the multitude of more mature statewide networks that flourish today connecting universities, colleges, and state government agencies, often on state-owned "back-bones" that provide very economical usage rates because of their aggregate, subsidized nature and high capacities.

In the case of other users, especially those private or smaller institutions that do not have the benefit of leveraging existing infrastructures, access to and reliance upon public switched service alternatives are critical. In addition, network strategies that depend on interstate or international access cannot be designed practically around a private or dedicated approach. In general, with the rapid proliferation and acceptance of the Internet and Web-based applications, the dedicated, private network approach is giving way to lower-cost, more widely accessible linkages. In these cases, design of network topologies should facilitate a variety of publicly available services, and connect with them in a user-friendly way.

Network Services

When evaluating network options for interactive learning environments, most focus today is on those services that specifically accommodate digital communications. Technically, these encompass terrestrial, microwave, wireless, and satellite transmission media. The primary focus here, however, is terrestrial services–the area exhibiting the most growth over the past decade, accounting for the majority of supported applications today, and providing the primary delivery mechanism for the Internet. These "land-based" delivery media are also likely to continue to present the widest range of options and access to users in the near future.

They include private and public T-1 service, fractional T-1 service, public switched-56 service, ISDN (Integrated Switched Digital Network), frame relay, fiber and ATM, and coaxial cable.

Public and Private T-1 Service. A T-1 line is the equivalent of 24 standard voice telephone lines, in digital formats. Each line (referred to as "channel") is capable of carrying either 56,000 bits per second (56Kbps) of data, or 64,000 bits per second (64Kbps) of data, depending on how the line is configured. Thus, the total information carrying capability ("bandwidth") of a full T-1 is 1.544 million bits per second (1.544Mbps). Since this medium is configured for digital information, the type of digital data is basically irrelevant, meaning that video, audio, data, graphics, text, and other digitized information can be supported.

A ***Private T-1*** circuit simply means that it is owned by a dedicated user, with defined endpoints, or service connection locations, and typically does not support connections to the outside world (public). Control of access and usage costs is the responsibility of the owner of the network. Many statewide networks are based on private T-1s because existing infrastructure can be "piggy-backed" upon by educational users. This typically has resulted in reduced ongoing costs, but limited connectivity outside the existing network.

A ***Public T-1*** circuit provides equivalent capabilities, but is not privately owned, and not limited to defined endpoints. In addition to linking between pre-defined, fixed sites, this service provides the ability to connect to the outside world. Access, scheduling, usage, costs, and management are controlled either by the public service provider, or by the lessor. This scenario typically yields higher ongoing usage costs, but better outside access.

Fractional T-1 Service. In recent years, carriers and service providers have begun offering partial segments of T-1 channels, called "fractional T-1" services. An example would be a videoconferencing user who only needs 1/4 (384Kpbs) T-1, or 1/2 (768Kbps) T-1 to support one or two conferences. This option allows users to pay only for the bandwidth, or segment, that they need for a particular application. This "pay by the drink" approach is still not widespread, is typically expensive, and is only practical for the occasional, low-use consumer.

Public Switched-56 Service. This is a commonly used service in the United States based on the most fundamental building block in the digital array, the 56Kbps channel. In most cases, two 56Kbps lines are combined to provide a total data rate of 112Kbps, often used for basic videoconferencing with low demands for quality or multimedia applications. This is typically referred to as Dual 56, and, as a switched service, can provide flexibility and easy access to other endpoints on the public network. Since this type of service typically uses no more than the equivalent of two telephone lines, it is relatively inexpensive. Corresponding to its low end of the cost scale, however, is the level of quality it provides, which is very limited. In addition, this service may be aggregated by combining more than two lines, based on throughput needs. It is heavily used by the private sector for business conferencing applications and data, but sees limited use in the more demanding education environment.

ISDN (Integrated Switched Digital Network). This has been one of the fastest growing segments of the digital services market, and has recently improved greatly in terms of cost and availability. ISDN is an international standard that has widespread pervasiveness in Europe and Japan, and has recently spread rapidly throughout the U.S. There are two kinds of ISDN circuits. ISDN BRI (Basic Rate Interface) circuits deliver two 64Kbps channels of data plus 16Kbps for signaling. ISDN PRI (Primary Rate Interface) circuits deliver 23 64Kbps channels plus another 64Kbps for signaling. ISDN has become heavily used for both videoconferencing applications and data (i.e., Internet, e-mail, World Wide Web, etc.), and as its access points multiply and prices continue to drop, it is likely to remain a major player in the digital services game.

Frame Relay. Developed primarily for data applications, Frame Relay services have also expanded dramatically in recent years. This service is basically a packetized, data transfer protocol that performs well in demanding, high-data-traffic environments, but is not well suited to supporting continuous flow applications (i.e., real-time video or audio) due to its susceptibility to network traffic impacts. Very recently, several carriers have begun expanding this service–once limited to local area network (LAN) environments–to widely dispersed geographic availability, as well as introducing limited capabilities for delivering interactive video and audio in compressed formats.

Fiber and ATM (Asynchronous Transfer Mode) Services. By far the most robust of the current mainstream network environments, ATM, which is usually fiber-based, represents a breakthrough communications protocol on several levels. First, it supports extremely high volumes of data (i.e., high bandwidth). Second, it does so while also making the most efficient use of available linkages. This is the direct result of its unique, multi-layered protocol, which enables users to dynamically allocate portions of the communications "pipeline" for voice, video, multimedia, and data use at any given time.

Coaxial Cable Services. Once limited to analog broadcast video and audio programming into the home, this copper-based infrastructure now presents an emerging world of possibilities for a wide range of digital applications, at relatively high throughput rates, and in interactive modes. Similarly, coaxial cable connectivity–using "set-top boxes" that convert signals to and from the appropriate formats–is now a viable option for most communities to access the Internet and World Wide Web.

Delivery Formats

Considerations surrounding network connectivity are directly entwined with the format of the information to be transmitted, received, downloaded, and shared. For the most part, educational technologies (video, audio, computer-based, Web-delivered) fall into the following format categories: Analog, Digital, Compressed, Packetized, Synchronous, Asynchronous, and Full-Motion.

Analog is a term typically applied to continuous waveform signaling. Analog video and audio were the prevailing formats until the emergence of digitization. They denote a continuously variable signal or "wave" as opposed to a discrete signal. Analog video and audio signals are

graphically illustrated as sloping curves (or sine waves), denoting power that is continuously varying, and typically incorporate modulation transmission schemes.

Digital refers to the discrete representation of analog signals in numerical steps. This is typically done by sampling many points along the analog signal curve, assigning discrete values to those measurements, and encoding them into digital bit-streams as defined by a series of "0s" and "1s." The higher the frequency of sampling points, or numerical intervals (steps), the more accurate the replication of the original analog signal. Therefore, the quality of digital signals is often defined in terms of "data rate," which reflects this sampling rate frequency.

Compressed refers to a process of economizing digital information. Since replication of analog signals via digital bit-streams requires large amounts of data (in the case of analog/full motion video, the data sampling rate required is roughly equivalent to 90 million bits of info per second!), strategies have been developed that greatly reduce ("compress") the amount of sampling necessary to achieve satisfactory signal quality. This compression is achieved primarily through sophisticated mathematical operations, known as algorithms, which intelligently sample, predict, and eliminate redundant information in order to minimize the amount of bits required.

Packetized information refers to "digital clusters" of bits that can be transmitted in spurts. Until now, we have been discussing signal formats requiring constant flow, or "synchronous" operation. Packetized environments, on the other hand, allow for two-way flow of digital information that can be interrupted as traffic demands dictate. This is the format of most computerized data flow, and characterizes virtually all LAN (Local Area Network) and WAN (Wide Area Network) environments. Although it is a very effective means of network management for computer text and graphics data, it has obvious limitations for real-time transmission of video and voice due to its susceptibility to interruptions caused by other network traffic.

Synchronous transmissions refer to information flow that is dependent on continuous communications. These include real-time video, audio, and data between two or more participant locations, within communications environments that cannot tolerate interruption of signal flow. In most synchronous environments, applications are shared at the same time, signals and timing clocks are set at a fixed rate, and communications protocols are observed to support regular "handshaking" between systems.

Asynchronous environments incorporate techniques whereby the time interval between characters may be of variable or unequal length (i.e., "packetized" bursts referred to earlier). In these formats, communication takes place at differing times and often at the convenience of the user. These environments are somewhat inadequate in supporting real-time applications such as teleconferencing, due to their inherent operational characteristics of multiple, random bursts, and competing traffic.

Full-motion is a common characterization of video quality that actually refers to an illusion. When video is described as full-motion, it typically means that the quality (motion, resolution, clarity, and smoothness) is equivalent to, or better than, that which is received in the home via cable or local FM TV transmission. This is also commonly referred to as "broadcast" quality. These descriptors were not often used (indeed had little meaning) until the emergence of other forms of video formatting and delivery (especially compression), and since have served as benchmark terms when comparing video signal qualities and performance. Put simply, full-motion, broadcast quality video is the best. However, the "illusion" referred to earlier is based on the fact that what we receive on our TV sets as full-motion is, in fact, not a smooth, uninterrupted image, but rather a series of single video frames. Each frame is displayed on the screen at a rate of 30-frames-per-second. The human eye and brain are able to compensate for this rapid-fire format, and the result is what we perceive to be an uninterrupted signal flow–as "full-motion"–without jerkiness or gaps.

Compatibility and Standards

Technology compatibility is an area of critical importance to network planners, administrators, and end-users. In addition to affecting practitioners on a day-to-day operational level, compatibility issues also have direct impacts on planning. Unfortunately, those who deal with standards on a regular basis know that they often foster a good deal of frustration, disappointment, confusion, and operational mayhem, for a variety of reasons. Much of the confusion surrounding compatibility issues is the result of inconsistent definitions, and frequently misunderstood claims by vendors, as to what "compatibility" really means. For purposes of this discussion, compatibility is separated into three general categories: standards compliance, connectivity, and interoperability.

Standards Compliance refers to manufactured products that are designed to comply with accepted standards for compatibility, at some level of interoperability. This typically includes technology components that can communicate with each other–regardless of the vendor or manufacturer–via shared standards and protocols. In the case of interactive compression technologies, an international standards body now known as the ITU (International Telecommunications Union, formerly CCITT) has made significant progress over the past several years in establishing basic standards for communications of digitally compressed video, audio, data, and shared files among varying manufacturers (commonly referred to as the H.261 and H.320 suite of standards).

Vendors and network providers have done some disservice to their users in the area of standards by continuing to promote "product differentiation" via proprietary designs and features, and perpetuating a "tech-spec" approach to the problem instead of focusing on real-world, functional impacts. Although technical specifications may be adequate on paper, they often fall short in the operational world, and the frequent result is frustrated users who are disappointed by the degraded performance and loss of functionality that often occur.

Connectivity can include the above, but also refers to issues involved in trying to connect differing network topologies, varying telecommunications formats, or distinct delivery technologies. For instance, interconnecting a two-way compressed videoconferencing

network with a satellite-based broadcast system involves significant challenges including:

- signal formats (digital versus analog)
- timing and synchronization (synchronize versus propagation delays)
- audio quality (echo and feedback phenomena)
- image quality (compressed versus full-motion)

Today, for the most part, these challenges are addressed through what are known as "gateway" configurations. Gateways rely on conversion to some common denominator (i.e., decoding the digitally compressed signal and converting it to analog for input and distribution via the broadcast environment, or vice versa). Once again, these very limited solutions invariably result in loss of functionality, signal quality compromises, logistical challenges, and administrative headaches. Not surprisingly, they also discourage practitioners from attempting to cross boundaries on any kind of regular basis among differing technologies, and foster perpetuation of dedicated, or closed, telecommunications "islands."

Interoperability, in this context, refers to the broadest operational sense, outside the "tech-spec" definition, and is measured from the perspective of the user. True interoperability means not only the ability to interconnect and communicate among differing vendor equipment without catastrophic results, but also to do so without loss of functionality or degradation of performance. This "transparency" is what users want and expect, and is similar to the challenges of the facsimile industry over a decade ago. As with any market-driven industry, until users demand total interoperability, they are not likely to receive it.

Data Rate Considerations

Much controversy also continues around the issue of data rates–what works, and what does not. As one might expect, the overall quality of picture, sound, data flow, and Web-based application performance in a digital environment is directly proportional to the amount of data being processed in a given time (i.e., the more information available, the better the end result). As data rates increase, so does overall performance in all these areas, including speed. Similarly, as the amount of data flow increases, so does the amount of bandwidth required (i.e., the size of the "data pipeline" which carries the information). As the pipeline size increases, so do the transmission costs. The result is an obvious trade-off between signal quality and network cost–and therein lies the controversy, and the challenge, for designers and planners.

Opinions vary widely as to the effects of compression on teaching and learning processes, student performance, and teacher acceptance. Based on surveys and research of real-world practitioners, the vast majority of education and training networks utilizing interactive video on a regular basis today have found nominal operating rates of 384-Kbps (1/4 T-1, equivalent of 6 phone lines) to 768-Kbps (1/2 T-1, equivalent of 12 phone lines) to be suitable from both cost and quality perspectives. This range seems to represent an acceptable balance between the driving factors described earlier. Most users do benefit, however, from having wisely selected systems that flexibly operate in a wide range of data rates–from 56-Kbps (1 phone line) to 1.544 Mbps (24 phone lines, or Full T-1). This flexibility of operation is highly

recommended for addressing diverse instructional needs and network requirements that evolve over time.

The "Menu": Ten Proven Technology Models

As noted, a key element of success in the new learning environment is knowledge of, and familiarity with, the available tools and how they can be best applied. The following "Menu" presents a summary of ten technology-based applications that are prevalent today, and which have proven to be effective over time.

Certain guiding principles should determine the selection of options from the menu. The effective use of technologies for learning–especially within institutions of higher education–relies heavily on an inclusive team and planning process, solid end-to-end strategy, and total solutions approach. The era of experimental or pilot programs to demonstrate the effectiveness of instructional technologies is largely behind us, and the primary focus as we move ahead is on the development of programs and practices that succeed based on competent planning, effective delivery, user-friendly access, and education quality. To those ends, the prudent practitioner should follow the basic guiding principles of assessment, planning, execution, and evaluation, which are referred to here as the "4-Ds":

- Define the problem and objective (assess)
- Develop the solution, strategy, and path (plan)
- Dedicate the resources, procure, and implement (execute)
- Determine the success, measure it, and improve upon it (evaluate)

Applying these principles may not always be easy, but adherence to them can significantly increase the overall likelihood of success, especially in terms of programs that withstand the tests of time and change.

Menu examples 1 through 4 each reflect an individualized learning model, that is, a technology setting most conducive to the single learner, whether at home, work, or school. Examples 5 through 10 apply to more traditional, group learning environments, and those that facilitate higher levels of interaction among learners in a shared setting. Although many pro and con attributes are identified, no judgments–either stated or implied–are made with regard to which application is superior to another. That determination is best made by the well-informed technology planner, based on needs, resources, and applications.

1. Computer-based instruction (asynchronous). Although certainly not a newcomer historically, this form of mediated learning has evolved over the past five years into a dominant instructional paradigm. Through the use of text, graphics, and multimedia, resident in a stand-alone PC (e.g., CD-ROM supplement), computer-based instruction allows both learner flexibility and minimal costs. It also promotes a more independent dynamic to the motivation for learning, as users have the freedom to digest information at their own pace, adjust their instructional schedules to individual lifestyles, and revisit specific content areas at will. Content for this environment can be expensive to develop, and, in the case of CD-ROM, is often static and difficult to modify or update. Nevertheless, this is often the entry-level application for many organizations pursuing technology solutions for teaching, training, or learning.

2. Computer conferencing (synchronous, asynchronous). A natural spin-off of PC applications, computer conferencing software allows two or more users to communicate via their respective workstations, either in real-time or asynchronously. Unlike computer-based instruction, however, a minimal network connection is required, typically via standard phone lines and modems. The primary advantage of this more interactive form of computer learning is its inherent capability to engage participants in real dialogue–whether during multi-participant sessions, or after the fact in a more asynchronous, "just-in-time" mode.

3. Online and Web-based education (Internet). By far the fastest growing area, this environment offers many advantages, along with some non-trivial challenges. On the positive side, access to the Internet and the Web–and therefore the programming that resides there–is increasingly available and affordable. This approach also leverages the global nature of the Web, its ease of use, low costs, as well as its role as gateway to almost unlimited amounts of information. On the down side, developing content that is both valuable and palatable to the user is not always easy, and is often costly. Similarly, strategies that depend solely on this medium are subject to the same throughput limitations (i.e., network bottlenecks) that plague our everyday use of an increasingly overcrowded Internet.

4. Desktop collaboration (interactive PC multimedia). One of the newer menu entrées, collaborative applications of video, audio, file sharing, and multimedia at the desktop is experiencing significant interest and growth. The reasons include new standards for delivery of these applications over communications networks previously limited to packetized data (i.e., LANs), better compression techniques, much higher performance characteristics of PCs, and increasing desire on the part of users to not be bound by expensive, structured, conferencing rooms or facilities.

5. Broadcast instruction (one-way video, two-way audio live). Having emerged as the dominant distance learning model of the 1980s, live broadcast instruction continues to play a major role in delivery of for-credit high school, undergraduate, and graduate courses, as well as staff development and training. Initially a "localized coverage" application, live video and audio broadcasts of educational programming experienced its most explosive growth with the proliferation of satellite networks and services that expanded distribution beyond regional limitations. Instructor-student interaction in these environments is typically achieved via two-way audio (i.e., phone line-based "talk-back"), and/or specialized Student Response Devices not limited to voice. Most existing broadcast systems today have already been digitized–converted to one of a number of digital compression schemes in order to get more available channels from the same amount of bandwidth. Advantages of this model include geographically wide, low-cost-per-receiver distribution of programming–regardless of existing land-based infrastructure. Disadvantages include ever-increasing costs associated with satellite transponder services, and incompatible digitization standards among networks.

6. Audio conferencing and audio graphics (multi-point live). This not-so-cutting-edge application continues to bring great value and effective delivery to widely dispersed learning populations. Audio conferencing allows three or more participants to carry on a live, interactive dialogue by connecting through a shared "bridge." Through the addition of

audio graphics technologies, a visual component can supplement the aural environment, resulting in an interactive exchange that can be effective in several disciplines. Its reliance on minimal phone services makes this technology an ideal choice for geographically isolated regions, developing countries, and poorer communities. One other advantage is the fact that this strategy's primary user interface–a standard telephone–is ubiquitous and requires little training.

7. Video conferencing (two-way video, two-way audio, compressed-terrestrial). Originally touted as best replicating the face-to-face learning environment of a traditional classroom, video conferencing adoption by the education sector lagged far behind corporate America. However, a combination of cost reductions, technology improvements, increased chip-processing performance, expanding digital network services, and implementation of standards resulted in an explosion of educational usage since the early 1990s. Further spurred by the advantages of "technology convergence," the overall effectiveness of the fully interactive video, audio, and multimedia environment for teaching and learning has been proven and well-documented over time. It now continues to be a primary offering in the suite of services typically associated with larger institutions and statewide systems of higher education.

8. Two-way VSAT (two-way video, two-way audio, compressed-satellite). The only distinction between VSAT and video conferencing is the delivery method. In the case of VSAT, fully interactive services are NOT dependent on existing terrestrial infrastructure. This is especially significant in developing countries, remote rural areas, and many international applications. It is also heavily used in military, emergency communications, and medical applications.

9. Multimedia conferencing (two-way video, voice, graphics, data-live). An enhanced version of basic video conferencing, this technology takes advantage of multiple applications within a shared, PC-based system. Its advantages are in combining the benefits of face-to-face instruction with the variety of other teaching and learning tools associated with PCs, CD-ROM, shared file applications, the Internet, and the Web. This is typically a terrestrial-based methodology, requiring T-1 bandwidth, ISDN, or above. It also relies on high-quality video and audio compression, and the ability to integrate them into a PC-based architecture.

10. Full-motion, two-way (fiber/ATM). This environment delivers high-bandwidth, high-quality, full-motion, interactive video over a wide area network (WAN). In most cases, the WAN is limited to a localized or regional infrastructure, but in the case of some states (e.g., Iowa and North Carolina), huge investments have enabled these infrastructures to achieve much larger coverage. The primary advantages of signal-quality superiority have already been stated, but disadvantages include the inherently "closed" nature of these networks, their typically high maintenance costs, and the historically slow roll-out (or development) of high-capacity fiber outside urban areas.

Technology Model Summary

It is important to reiterate previous conclusions regarding these options. First, they all work well within their respective application areas. Second, they are only as good as the content

and people that drive them. Third, they can be successfully used in conjunction with each other as part of a "hybrid" development process.

Lessons Learned

New entrants into the technology-based learning arena may take heart in the fact that the work, successes, and failures of the past provide valuable lessons for today. The following may be considered a "Top Ten List" of things worth remembering:

Good teaching is good teaching, and bad teaching is even worse in a technology-based environment. Those expecting technologies to gloss over instructional deficiencies or lack of preparedness are in for a rude awakening.

Technology as "replicator" is largely a waste, and misses the point in terms of opportunities for enhanced access, interaction, collaboration, and engagement. The true power of these new tools lies in their ability to facilitate creativity and change.

The best technology in the world cannot fix an inferior program, which logically supports the premise that content and instruction should drive the selection and use of the right tools.

Cost recovery is a viable objective, but should not be the driving motivator. As a strategic priority, it should fall somewhere below improved access and enhanced learning opportunities.

The vendor that comes to you with "the solution" is the vendor to beware. Time has taught us that the best solutions are those that combine a variety of technologies and delivery methods into an optimal hybrid that is flexible and grows over time.

Technology = choices, nothing more or less, while people and content = success or failure. Obsession with the tools is sometimes difficult to avoid, but must be overcome if we are to accomplish the overriding missions of quality content and effective learning.

Reward the risk-takers, or you will pay later. Every project depends on internal champions, instructors and staff who are willing to take the risks do the extra work and venture onto new ground. If organizations do not sufficiently compensate and motivate these special individuals, they will either leave or burn out.

Stick to standards as they apply to both technologies and content, whenever possible. On the equipment and connectivity side of the equation, standards for compatibility, interoperability, and gateways among varying manufacturers and network topographies provide both flexibility and longevity. On the human side, standards for content development and quality are essential to succeeding in a competitively evolving education environment.

Outsource when it makes sense and seek "win-win" partnerships with private sector providers. Focus on the things your organization does well, and look to external resources (e.g., vendors, manufacturers, consultants, service providers) for those areas that are not core internal competencies or strategic operations.

Plan, plan, plan and then execute in ways that adhere to that plan. This process can and should be dynamic, but must maintain consistency and commitment to basic project principles.

Basic Design and Environmental Considerations

Current operating environments for distance learning range from small, one-on-one computer-based scenarios (individualized), all the way to large and elaborate multimedia centers accommodating 300 people or more (group). Obviously, guidelines vary greatly across this spectrum. What is common, however, is the need for flexibility and multipurpose use, primarily driven by the realities of limited and overcrowded facilities that cannot be dedicated solely to distance learning or technology-based training activities.

Any technical design or equipment strategy is only as good as it is relevant to the instructional goals, needs, and pedagogies of the end-user. Therefore, any recommendations set forth should be tempered with common-sense teaching principles, ensuring that people and applications always drive technology decisions, rather than the other way around. (See further discussion on effective distance learning course design in Chapter One.)

Several key elements make up the defining parameters for a successful design of technology-based environments for education and training:

- instructional objectives
- room selection and location
- environmental considerations
- electrical
- acoustical
- lighting
- cabling
- H/VAC
- network connectivity
- room design and configuration
- equipment
- primary room equipment
- network interface equipment
- optional teaching tools

The wise facility planner or system designer will also base technology decisions on requirements defined within the instructional contexts of his or her institution, instructors, students, and curricula. It is imperative that the planning and design process be inclusive, to ensure that the technology and tools developed are compatible with a number of instructional factors:

- Instructional needs and objectives
- Teaching methodologies and styles
- Expected classroom dynamics
- Levels and types of student interaction
- Projected class sizes
- Content and curriculum

Technology Is the Means, Not the End

The positive restructuring of our teaching and training models can only come about through the acceptance of new roles, responsibilities, partnerships, and skill sets involving teachers, instructors, and learners alike. Technology can substantially enable this "quantum leap forward" by encouraging team teaching, mentoring, knowledge brokering, collaborative learning, and a certain amount of positive risk-taking. In this context, instructors are advised to look beyond the mindset of replication, of training yet another generation of test-takers, and to embrace a vision of empowerment through change–a vision in which the effective use of technologies can play a significant role.

In developing and implementing a technology strategy, it is important to understand the right things to do, as well as the pitfalls. Experience has proven that four factors have common relevance and validity in a wide range of scenarios, regardless of technology, and that they can often serve as meaningful measurements for planners and practitioners alike:

- Adoption of an inclusive team approach
- Thorough assessment and integration of the results
- Commitment to training as an ongoing program
- Adequate support services for developers, instructors, and students

Summary: Guiding Principles

As technology options have evolved, several fundamental truths have emerged:

- Engagement is critical–with each phase in the progression of new applications for technology, the level of interaction between instructor and learner has typically been enhanced. The resulting effect on learning performance has been shown to be proportionately positive.

- New and cutting edge is not necessarily best. Although each methodology listed has distinct advantages and disadvantages, no one approach is absolutely better than another. In fact, all of the technologies referenced are being used successfully on a widespread basis despite their maturity, and often are more effective in conjunction with one another.

- Synchronous boundaries are giving way to asynchronous options (as technologies have evolved from reliance on traditional, structured settings, instructors and learners are benefiting from new alternatives that combine the best of both worlds). In addition to offering flexibility that is more adaptive to personal lifestyles and schedule demands, these new options also support a growing number of individual learning styles.

- Audio is critically important. In synchronous, real-time, technology-based learning environments (i.e., "live settings"), complaints from users about unacceptable or distracting audio quality far outweigh all others. Ironically, this is especially true in those scenarios relying most heavily on the video component. The final irony is that planners all too often ignore this area, devoting the majority of their time and expense to more visual considerations.

- The human side of the equation is always the most challenging. Although it is very easy to get bogged down in the technical aspects of this often exciting voyage, experience has consistently shown that success in the new learning environment depends upon at least an equal amount of concerted focus on the "human elements." Our tendency to become enamored with new and exciting technological wizardry should not make us lose sight of the fact that its real value is in the provision of useful and seemingly transparent tools that can be used effectively to enhance access and improve the teaching and learning processes.

The next chapter delves deeper into utilization issues, effective techniques, and evaluation criteria that are essential to instructors and planners in choosing and implementing the right tools.

Instructional Technologies-Part Two Strategies for Instructor Success

Selecting and Using Distance Education Technologies

Don Olcott, Jr., The University of Arizona

Chapter Overview

While Chapter Two addresses the technical and logistical issues surrounding video, audio, and Web-based technologies, Chapter Three focuses on the advantages and limitations of these technologies and offers teaching tips for improving your teaching pedagogy at a distance. Topics covered include:

General Lessons from Practice for Distance Education Instructors
Video-based Systems
Audio-based Systems
Computer-based Systems
Integrated Technology Systems Design (ITSD)
Aligning Learning Objects with Technology Selection
Summary: Guiding Principles

A table of Technology Media Matrix Selection Factors is offered to assist instructors in assessing technology characteristics related to course design, content, goals, and objectives. This chapter concludes with a description of Integrated Technology Systems Design (ITSD) and how instructors can apply this framework to maximize the integration of multiple technologies into their course design.

Introduction

Technology, in and of itself, will not ensure high-quality distance teaching. Only the creative talents of the teacher can ensure this. This chapter examines the range of video, audio, and computer-based technologies used in most distance learning programs, including their general advantages and limitations. At the end of each section, general teaching tips are presented for instructors using these technologies.

General Lessons from Practice for Distance Teaching Instructors

Individual instructors must assume the major leadership role for their courses. Distance learning courses require working with instructional designers, production technicians, evaluation experts, and support service units. Instructors newly undertaking distance learning often feel that their courses have been taken over by "the experts" and that their autonomy and instructional control have been compromised. Nevertheless, effective distance learning has little to do with technology. Rather, collaborative efforts among all

stakeholders that place instructors at the center of the teaching process are what makes distance learning a quality experience for instructors, supporting players, and most important, students.

Instructor selection of distance learning technologies requires assessing course content, learning outcomes, and interaction needs before selecting the best technology mix. Moreover, there is no perfect technology mix that provides high quality, low cost, and pedagogical excellence. The complex range of variables for successful distance learning requires a balance between quality, cost, and access. Given the resource constraints on most technology-based programs, instructors must carefully examine the best mix of technologies that make sense economically, pedagogically, and logistically. And, these decisions must be based foremost on the most effective balance to provide sound teaching and learning experiences for the distance learner.

Instructors must be innovative and creative in their distance learning courses. Assuming that everything that worked in the regular classroom is transferable to distance learning courses will inhibit instructors from adapting their strengths and improving upon their limitations for learners. Instructors must also be given the time to experiment and practice their new teaching strategies for distance learning. Within this context, time spent on technology is important primarily because instructor competency and comfort level with the technology makes students feel more comfortable and confident in this learning environment. This removes technology from the forefront of the process, making it simply a delivery tool, thereby placing the focus on competent teaching and improving learning. Vince Lombardi once said, "Practice doesn't make perfect . . . perfect practice makes perfect." Practice for instructors is essential for consistent distance teaching quality.

Video-based Systems

Video-based systems generally have unlimited geographical capacity to reach isolated audiences and approximate the traditional face-to-face classroom. Commonly used video-based systems include satellite delivery (two-way audio, one-way video), compressed video (two-way video, two-way audio), cable television (one-way video supplemented by audio discussions before or after broadcasts), and microwave and fiber optic networks that employ various combinations of one-way and two-way video and audio.

It is important for instructors to remember that all these delivery technologies can be generally categorized under instructional television–they are all video-based delivery systems whose technological specifications are not major concerns to the teacher. The instructor simply needs to know that when employing video, these systems operate similarly and differ primarily on picture quality, costs, and access for students.

Instructors should also recognize that video-based systems seem like the natural delivery system at first glance, but costs and pedagogical attributes must be carefully considered before making an investment in time and resources. The question becomes, how do we justify these investments when lower end, cost-effective technologies may do the job? Video can be an effective distance learning delivery system but will face considerable competition from lower-end audio, print, and computer systems in the future.

Advantages of Video Systems

- Video systems typically, but not always provide real-time interaction between teacher and student (e.g., cable TV).
- Video systems most closely approximate the traditional classroom, providing a natural comfort level with this learning environment for teacher and students.
- Visual/audio communication between teacher and students creates (but does not guarantee) maximum opportunities for teacher-student and student-student interaction.

Limitations of Video Systems

- In general, video systems are expensive compared to audio and computer systems. Institutional capital costs to support video-based learning can run into millions of dollars even before upgrade and maintenance costs.
- Video-based teaching and learning is also labor- and time-intensive. Course development, technical production, instructor training, and administrative and student support services require considerable resources and planning time.
- Video teaching can place instructors under increased scrutiny by peers and students. This is a disincentive for many instructors who are accustomed to closing the door to their classrooms and having complete control and intimacy with their students.
- Video teaching is oversold as the most effective distance teaching method. The research supporting video's capacity to replicate the regular classroom is mixed at best.

Practical Applications for Video Systems

- Multi-site delivery where students are dispersed geographically. For example, delivery to branch campuses linked by compressed video or satellite to downlink sites at county extension offices.
- Effective for non-credit professional development programs that must reach large audiences.
- Videotaped sessions subsequently broadcast over local cable that can be supplemented by print, the Internet, and periodic audio conferencing for interaction.

Teaching Tips for Video-based Systems

- Diversify your delivery style. The traditional lecture "talking head" dispensing information will bore students. Integrate a good mix of visuals, guest speakers, slides, video-clips, and interactive exercises.
- Be yourself . . . most of us are not Jack Nicholson or Meryl Streep and students know this. They will expect you to act normally. Nevertheless, you can create opportunities for humor on the air (e.g., dress up at Halloween, tell funny stories, etc.). That will help you and your students relax and enjoy this learning process.
- Get to know your students by name and site when there is more than one delivery location. Set up a listing by site, and actively ask questions of all students to facilitate interactive discussions. This will not happen by itself. Research suggests

that teachers tend to call on the same students and those students are usually the ones who want to talk. By encouraging all students to participate, you engage and challenge all students. Assign group exercises off-air and have the groups do presentations when you are on-air.

- Take the time during each class to ask students at all sites if the video and audio are clear. Remember that audio is just as important as the video component and is your interactive medium. Technology can and will fail! Do not panic when the video goes out–humor the students via audio and move ahead and adjust as necessary. If the video fails while you are showing slides, jump to a section of the lesson in which the audio can get you through. You set the tone for every class and every glitch that occurs. Students all have experienced technology on the blink, so make light of it and calmly move forward.

Audio-based Systems

Most instructors have experienced something akin to the audio-based process through participation in professional conference calls. In audio teleconferencing, instruction originates from a studio or other location that is then delivered to one or more sites that have speakerphones for teacher-student interaction. Audio systems also include voice mail and audio graphics technologies. Today, the Internet and World Wide Web can effectively supplement audio systems. In general, audio systems can be cost-effective, flexible, easy-to-use, and highly portable when used for distance learning.

Audio systems are often viewed as supplemental technologies rather than as the primary instructional delivery media. With the advent of new Web technologies, and research documenting the effectiveness of audio systems, institutions are increasingly using audio systems as primary delivery media.

Advantages of Audio Systems

- Audio systems are typically low-cost, flexible, easy to use, and portable, for synchronous and asynchronous formats.
- Audio systems can be effectively supplemented by print, fax, videotapes, the Internet, and assigned cable broadcasts.
- Some students feel more comfortable interacting via audio rather than video.
- Audio systems are an excellent technology when disseminating information or conducting discussions of preassigned content are the primary instructional goals.

Limitation of Audio Systems

- Without a video component, instructors must devise innovative communication strategies in their teaching to ensure maximum interaction. Instructors must keep the interactive dialogue moving to prevent a "talking head" scenario from developing which will deter student participation.

Practical Applications for Instructors

- Brainstorming sessions of major concepts and theories.
- Summary or review sessions of content.

- Excellent for small class sizes (eight to ten) where discussions provide greater opportunities for in-depth analysis.

Teaching Tips for Audio Systems

- Plan self-directed learning activities and small group discussions that give students maximum opportunities for interaction.
- Use site facilitators if resources allow, as they can help facilitate on-site discussions and assignments.
- Pace instruction appropriately. Remember that audio teleconferencing is new to many students and they need time to adjust to the medium. Provide positive reinforcement and feedback regularly, as well as periodic reviews of materials covered in previous sessions.
- Supplement audio with other lower-end technologies such as fax, videotapes, Internet, Web resources, and print materials.
- If possible, visit each site and teach from that site. This will allow you and the students a chance to get to know one another.

Computer-based Systems

Computer-based systems are versatile delivery systems that are being used as primary delivery media, support media, access to online library resources, and for the delivery of online student services. Today, the Internet and the World Wide Web have increased the range of applications for computer-based distance learning. Computer systems, while usually operational in asynchronous modes, can be supplemented by audio links for synchronous delivery. Computer-based training (CBT), which is prevalent in corporate training programs, is an effective delivery venue for specific instructional goals. CBT programs can be relatively expensive, depending on the level of training program, instructional design and development costs, and the complexity of the program.

Advantages of Computer-based Systems

- Computer systems have excellent asynchronous delivery capabilities, particularly when using the Internet and World Wide Web to provide flexible instruction to distance learning students.
- Most computer-based systems are available at moderate costs.
- Computer systems provide maximum written interaction for students who are more comfortable interacting online than in the classroom or via other distance delivery systems.
- Computer systems can be effectively supplemented by other instructional delivery systems, including print, audio, videotapes, fax, and voice mail.

Limitations of Computer-based Systems

- Students must have access to computer systems and applications to take courses.
- High-end computer-based training and Web course development can be expensive due to time-intensive labor costs for instructional design and development.
- Students and instructors must be computer literate to maximize the capabilities of the systems for effective teaching and learning.

Practical Applications for Instructors

- Web and Internet delivery in which instructional goals are designed for maximum independent work by students.
- Writing intensive courses where the continuous development of writing skills is a major course component.
- Development of skills or competencies where repetition is required for mastery.

Teaching Tips for Computer-based Systems

- Carefully define course goals and objectives to enhance student learning via computer-based systems. Instructional design assistance is particularly important for computerized instruction for ensuring student understanding and participation.
- Supplement all computerized lessons with opportunities for audio interaction. This might be accomplished by integrating audio conferences at times when key instructional points are being discussed or in reviewing for examinations for class projects.
- Organize chat sessions and listservs for communicating with students. Ensure that students have the e-mail addresses of all other students to facilitate interaction for small group projects, individual assignments, and examination review.

Integrated Technology Systems Design

Integrated Technology Systems Design (ITSD) requires instructors to assess how to integrate multiple technologies into individual course design. ITSD provides colleges and universities with an outreach strategy to harness the arsenal of technologies to deliver distance learning instruction. Technology selection is not an "either-or" proposition where all instruction must be video, or audio, or computer. The strength of ITSD is that it creates the catalyst for instructors and support personnel to critically examine how to blend synergistic technologies in pedagogically effective formats.

Table 1 (Olcott, 1997) provides a matrix for instructors to assess the various distance learning technologies, balance their advantages and limitations, and align instructional goals and objectives with the optimum media mix. It indicates the cost, quality, and student preference for each technology relative to the others, and suggests support technologies that blend well with each primary delivery technology. This matrix is neither all-inclusive nor the definitive panacea for selecting delivery technologies. However, it does provide a useful guide for instructors and support personnel to build upon flexible instructional design and delivery formats that balance quality, access, and costs.

Table 1 – Technology Media Matrix Selection Factors

Delivery System	Cost	Geographical Capacity	Quality	Training Required	Number of Students	Support Technologies	Real Time Interaction	Asynchronous Interaction	Client Receptivity	Number of Sites
Digital Satellite	High	Worldwide	Excellent	Faculty Technicians Site Coordinators	200+	AT E-Mail Fax RVT Print Computer	Yes Low	Yes Low	Excellent	50
Compressed Video	Low-Moderate	Regional and State	Good	Faculty Technicians Site Coordinators	30	AT E-Mail Fax RAT Print RVT Computer	Yes Low-Moderate	Yes	Good	6-8
ITFS	Low-Moderate	20-30 Miles Line of Site	Good	Faculty Technicians Site Coordinators	30	AT E-Mail Fax RAT Print Computer	Yes	Yes	Good	4-5
Audio Conferencing	Low	Worldwide	Good	Faculty Technicians Site Coordinators	40-50	VT E-Mail Fax RVT	Yes High	Yes Moderate	Good	8-10
Voice Mail	Low	Worldwide	N/A	User	N/A	N/A	No	Yes	N/A	N/A
Fax	Low	Worldwide	N/A	User	N/A	N/A	Yes	Yes		Same as Number of Students
CBT	Low	Worldwide	Good	Faculty Students Site Coordinators	15-20	AT RVT Print RAT Fax	Yes High	Yes Moderate	Good	10
Internet	Low	Worldwide	Moderate	User Faculty	20	AT RVT Print RAT Fax	Yes High	Yes Moderate	Moderate	20
Print	Low	Worldwide	Good	Faculty Students	20-30	RVT RAT Fax Audio E-Mail Voice Mail	No Low	Yes Moderate-High	Good	20-30

AT = Audio Teleconferencing
VT = Video Teleconferencing
RVT = Recorded Video Tape
RAT = Recorded Audio Tape
N/A = Non Applicable

(Table reprinted with the permission of the *Journal of Public Service & Outreach*, Article by: Don Olcott, Jr., Ed.D., Fall 1997 issue, vol. 2, no.3.)

Summary: Guiding Principles

In general, no one technology is a panacea for achieving the optimum level of all learning outcomes. Conversely, instructors will not have the latitude to integrate all technologies into a course based solely on achieving the best match with learning objectives. There are some general principles that instructors can use as a guide in this process. These are based upon the five "I"s of effective distance teaching: **interaction**, **introspection**, **innovation**, **integration**, and **information**.

- ***Interaction***. Learning objectives must be aligned with the type of interaction desired (student-instructor, student-content, and/or student-student). Video and audio systems work well for student-instructor interaction. Print, Web, and Internet can be used effectively for student-content interaction and in asynchronous formats. Online chat rooms work well for facilitating student-student interaction. See Chapter Three for an exploration of all three types of interaction in distance learning.

- ***Introspection/Praxis***. Instructors whose learning objectives revolve around learning complex concepts and theories require students to mentally engage in in-depth analyses, articulate their interpretations, and revise (praxis) their original understanding of the content. In such courses, online case studies and videotapes of specific concepts and theories can provide students opportunities to review the basic concepts. These learning objectives can integrate more than one technology to be effective. Video provides a visual connection for students; audio can be an effective conveyer for the instructor to summarize major points in concert with either print materials or computer graphics. Regardless of the technology employed, practical examples where students can apply their understanding of the content is critical.

- ***Innovation***. Research tells us that students have diverse preferred learning styles. Of course, instructors usually do not have the time or resources to align their courses to fit each student's learning style. Instructors can, however, experiment with different approaches and technologies that provide visual, audio, and asynchronous opportunities for students to learn. More important, if students have different learning styles, then it is reasonable that multiple assessment approaches may be warranted. Instructors should develop two or three assessment approaches and let students self-select their preferred method of assessment. Students usually know which assessment method suits their particular style of learning.

- ***Integration***. Learning objectives are seldom synonymous with isolated pieces of knowledge. Rather, they reflect the integration of facts, concepts, theories, and applied knowledge. Online case studies, print exercises, and even video-based role playing can provide learning environments conducive to the integration of knowledge, in which students are challenged to understand and demonstrate how the pieces of the intellectual puzzle fit into the bigger picture.

- ***Information***. The infamous reputation of "talking heads" emanates as much from regular classroom instruction as from video-based teaching. However, the point is that understanding information is often a prerequisite for students to move to the next level of learning. This will not happen unless the instructor creates a variety of checks to ensure that prerequisite information is understood and familiar to students. Any technology can disseminate information; the instructor must create interactive opportunities and assess whether students have the basic knowledge to move forward to the next level of learning.

The five "I"s of effective distance teaching are not based upon technology. Rather, they are based upon the fundamentals of good teaching and can be applied in any teacher-learner environment.

Instructors are the leaders of the distance learning enterprise and must be provided maximum support in the design and delivery of their courses. Given the diverse range of available technologies in concert with varying instructional goals and objectives, technology selection and use requires careful analysis to balance access, quality, and costs. There is no simple solution to this process. Instructors must familiarize themselves with their institution's technologies, determine their course goals, objectives, and learning outcomes, and then select the optimum media mix for delivery.

Effective Methods of Communication and Student Collaboration

Mary Boaz, Murray State University

> *Communication is the process of sharing ideas, needs, and perceptions and can be used to build considerable unity and rapport between educational staff members, adult clients, and the institution. It is, by definition, the giving and receiving of meaning, the mutual exchange of ideals, needs, perceptions, options, facts, and other items of interest. To be effective, communication should flow multidirectional (to all people concerned) and should be two-way in nature.*
>
> Verduin & Clark, 1991, p. 179

Chapter Overview

This chapter provides an introductory discussion of communication issues related to teaching at a distance. It also considers communication factors related to enhancing learner to instructor, learner to learner, and learner to content interaction in audio, video, and computer-based distance learning environments. The following sections are included:

Bridging the Distance
Evaluation
Student Questions
Enhancing Student Involvement
Summary: Guiding Principles

Introduction

Communication between instructor and student should be clear and concise and should support learning objectives. This holds true for all instructional settings, but is critical for distance teaching and learning, where students cannot rely upon casual contact and conversation to build expectations regarding these objectives. This chapter will explore strategies for bridging the distance and enhancing student involvement with the instructor, with content, and with one another. Specific tips will be offered for using a variety of technologies, in both synchronous and asynchronous environments.

It is important to "focus on the outcomes of interaction rather than the agents of interaction" (Wagner, 1997). While the delivery technology may present certain constraints or offer particular advantages, content and learning objectives should drive the choice of communication strategies. Generally, teachers should work to strike a balance between designing activities that allow learners to work independently and those that allow learners to work interactively with others. This usually means adopting a mixture of synchronous and asynchronous activities and technologies.

Whatever technologies are used, students will need both technical orientation and help in establishing new communication protocols. Distance learning students may be in a new social setting that requires new communication and learning skills. The loss of nonverbal cues may make communication difficult. Students in audio and videoconferences report an initial uncertainty regarding how to gain the instructor's attention. Computer conference students become confused as to how often they should be communicating. As a result, communication ground rules need to be established early in the class to establish protocol and the rules of engagement for interaction in a distance education environment.

Bridging the Distance

Establishing an open, inviting, non-threatening learning environment is the best strategy for bridging the distance between instructor and students, as well as among the students in a class. "Teacher immediacy behaviors" invite interaction, suggest approachability, and foster positive outcomes in students (Dillon & Walsh, 1992). By incorporating these behaviors into their courses, instructors can create a positive learning environment regardless of the technologies or methodologies involved.

Get beyond the technology and humanize the distance by focusing on the students rather than on the delivery methods. Personalize by learning and using students' names. Take time early in the course to get to know students' backgrounds and experiences. Chapter One of this handbook suggests ways to leverage the diversity of student backgrounds to better accomplish particular learning objectives. It is also important to be conscious of cultural backgrounds, since often humor is culture specific.

Tips for audio- and video-based courses

- During the first class meeting, have students introduce themselves or interview one another and then introduce their classmates. This gives students an opportunity to become familiar with each other as well as more comfortable using the technology.
- Award prizes to students who can name all their classmates at all locations. This is particularly challenging in large class settings with multiple locations.
- Be sure to focus on the individuals rather than the locations. It is easy to attribute characteristics of a few students to the entire site: "New York, you are certainly being vocal tonight." Once you begin personalizing the distance by focusing on individuals, all students feel included.
- Smile. Smiling is not only a positive visual cue, but also affects our voice quality. Smiling is the simplest form of acceptance. It also relieves stress (which technology can bring about). Use this technique often and in every learning environment.
- Diversify and pace course content. Intersperse presentations with student centered activities.

Tips for computer-based courses

Since students using computer-based technologies are often working in isolation (asynchronously), instructors need to establish a sense of online community quickly.

- Provide links to student homepages or have each student complete a profile that can be posted to the Web. Instructors and peers can use this information to learn about one another and look for commonalties beyond the shared course.
- Post questions using threaded discussion to stimulate group dialogue.
- Create assignments that encourage students to work in groups off-line.

Evaluation

In distance learning, it is particularly important to provide positive, individual, prompt feedback to student work and questions. Students need an accurate means of measuring their success, or potential for success, early in a course. This can make a difference in whether the student chooses to remain in the class. Distance learning students cannot always judge their progress in a course as easily as those in a classroom environment. Therefore, more targeted, direct feedback is crucial.

Feedback is also critical for the instructor. Students should be given opportunities to provide their own evaluative feedback. Egan and Gibb (1997) employ a "Stop, Start, and Continue Form" that asks students to identify behaviors or procedures the instructor should stop, start, or continue. Chapter Six takes a closer look at methodologies for testing and evaluation at a distance.

Tips for audio- and video-based courses

- During the first few class sessions, students are often concerned with the logistics of the technology involved in interaction. Take note of students who have low levels of participation and contact them individually to be sure they feel comfortable with course delivery methods.
- Reward those who do interact with positive reinforcement for their participation.
- Require a written assignment early in the semester. Return graded assignments quickly, with detailed comments. This provides an early opportunity to make note of and correct any logistical problems.
- Consider games and fun activities that get the students past the limitations of the technology and focused on interacting.

Tips for computer-based courses

- E-mail is a great medium for delivering individual and prompt feedback. However, the flood of e-mail from students can become overwhelming. You may want to establish a separate arena to handle technical (non-content) questions.
- Encourage students to respond to one another, using e-mail or threaded discussion groups.
- Clearly state the "rules of engagement" so that protocol and "Netiquette" are understood by all. Describe appropriate and inappropriate online behavior.

Student Questions

Accessible and open communication with instructors is critical for distance learning students. Dropping by the instructor's office or staying after class for a chat are not options for these students. Invite student contact by listing and encouraging all communication options: phone (office hours), mail, e-mail, fax, and individual video and/or computer conferences.

Tips for audio- and video-based courses

- Designate the first or last ten minutes of each class for meetings with individual sites. Rotate the sequence so that each site regularly receives individual attention.

Tips for computer-based courses

- E-mail can overcome barriers of time and distance, connecting students to the instructor and to each other. It is particularly helpful to students who do not speak English well.
- Use the telephone when appropriate. Many individuals feel better if they have heard a "human voice." Follow up conversations with an e-mail note.

Enhancing Student Involvement

Student involvement is the foundation of effective teaching strategies. Higher-level learning such as analysis, synthesis, and evaluation is best accomplished through interaction. Yet "good interaction doesn't just happen–it has to be designed" (Moore, 1996). Instructors need to develop deliberate strategies for enhancing interaction, particularly in a distance learning environment.

Moore and Kearsley (1996) note three types of interaction

- Learner to instructor
- Learner to learner
- Learner to content

Learner to Instructor Interaction

Questions provide a foundation for instructor-student interactions, regardless of the technology chosen. Students use questions to clarify information they receive. Instructors, using effective questioning strategies, can accomplish a great deal more. Questions based on Bloom's taxonomy, for example, can move students from a basic knowledge/recall level toward a critical thinking level. Questions should be planned and sequenced to direct the overall class discussion in order to meet the learning objectives.

Characteristics of a good question (Cyrs & Smith, 1990)

- Prepared, yet appears spontaneous
- Directed at specific intellectual level
- Phrased to be clear, concise, and specific
- Requires reflection before answering
- Relates to learning objectives

Good questions can keep students alert, stimulate thinking, provide testing cues, guide student thought, and help determine students' levels of understanding.

Good questions should jump-start interaction, use ideas rather than memorization, require open responses, and review and emphasize learning objectives.

Tips for audio- and video-based courses

- Ask questions and then allow sites to pool thoughts prior to responding. This also encourages student-student interaction and team building.
- Use silence to encourage reflection. Do not feel pressured by the technology to keep discussion constantly moving; give students time to offer thoughtful responses.
- Accommodate for the time delays in long-distance communications. When using some systems, allow a four-to-five second timeframe to enable students to pose a question.

Tips for computer-based courses

- Questions in an asynchronous environment allow learners (and instructors) more time to process, reflect, gather data, and synthesize before responding.
- To save time in dealing with more straightforward issues, have several FAQs (lists of frequently asked questions with responses) prepared and ready to transmit via e-mail.

Learner to Learner Interaction

Collaborative learning in distance education can be an enriching experience. It promotes a sense of unity among students, and its synergistic features generally produce high-quality results. However, it is time-consuming. Instructors should not only provide opportunities but also allow ample time for activities.

Tips for audio- and video-based courses

- The technology environment can provide initial opportunities for students to collaborate at their individual sites, by assisting each other in its use and engaging in joint problem solving when technical problems arise.
- As long as individual locations have sufficient enrollment, cooperative learning activities closely resemble those in traditional settings: panel discussions, case studies, peer teaching, and role playing, to name a few.
- "How do I combine one student at location A with three students at location B for small group collaboration?" is a common multilocation dilemma. Generally, the technology is flexible enough to connect sites A and B together, while your other locations continue to work together on a separate connection. But remember, deviations from the site connection schedule requires planning, assistance from technical support, and additional expense. This is not recommended for small group activities.
- A combination of muted microphones or lowered speaker volume can allow two or more sites to collaborate without interfering with the remaining sites. Sites not participating simply lower their volume or mute their microphones.
- "How do I listen in on group activities to ensure they are on the right track?" One method is to set a timeline for group activities. After the first 15 minutes, require them to fax their brainstorming notes, which you return to the group promptly with feedback. At the end of the session, require a short narrative summary that can be presented to the larger audience or reviewed and responded to by the instructor.

Tips for computer-based courses

- The Internet and World Wide Web, combined with a variety of user-friendly hardware and software, allow for an almost endless list of collaborative activities. Students can readily be grouped in this asynchronous environment through distribution lists, user groups, and listserv technologies.
- All activity is automatically documented, so "listening in" to students' group processes can be as simple as reading e-mail.
- Successful collaborative activities include students maintaining and sharing journal entries, creating a class homepage, and establishing an electronic class bulletin board.
- Assign different students the moderator's role in e-mail discussion. Require that they pose the thought-provoking question, initiate the discussion, and summarize the topic at the conclusion.
- Establish a pro and con forum, where students are required to take a position on a topic and defend it. Move away from opinion by requiring support documentation.
- Provide synchronous computer forums to shorten decision-making time for group activities.
- Web-based projects can be more informed and of broader scope by utilizing course-related information from around the world.
- Establish a set of "rules of engagement" for computer-based communication (Netiquette) at the outset of the course; this will reduce the number of contextual misunderstandings among students.

Learner to Content Interaction

The distance education environment can offer unique opportunities for designing and/or supplementing course content. Instructors should take advantage of each delivery method's strengths.

Tips for audio-based courses

- Audio conferencing has enormous flexibility because just about anyone who has access to a telephone can participate. Guest speakers and field experts are thus easily accessible. Besides conveying content, these guests also provide vocal variety. Listening to a variety of speakers and class discussions, can be an uplifting, less fatiguing experience for students.
- Print material, such as study guides with structured note taking, provides students with a focus during class.

Tips for video-based courses

- Instructors should take full advantage of the visual medium. Show short "trigger videos," such as a part of a speech or a clip from a classical movie to prompt class discussion.
- Bring in guests who can offer visual demonstrations of course materials.
- Involve students in role-playing activities. This is also a good way to enable students from different sites to get to know one another.

- Interview experts on-camera, or have students interview them.
- Show graphics, pictures, slides, and other visual material to communicate information in different ways and add visual interest to the class.

Tips for computer-based courses

- Have students participate in online simulations, which you can design yourself or purchase.
- Encourage students to join electronic discussion groups or forums.
- Online resources (Web sites, abstracts, and full-text documentation) can offer an inexpensive supplement to course materials.
- Place self-grading quizzes online. These can be taken more than once for drill and practice.
- Teach students how to assess the value of Internet resources. Students are often better at locating resources than at judging their relative value.
- Direct students to online sources by providing links. Try to direct them to specific pages or even paragraphs of Web sites, especially if the link is several pages long or incorporates several links of its own. Students can get sidetracked before finding the resource you intended.
- Post image galleries, such as slide shows, on the Web for review and study.

Summary: Guiding Principles

- The focus should always remain on the individual, not on the technology.
- Meaningful interaction and collaboration between students and instructors is the key to students being successful in the course.
- Generally, a mix of different technologies, with both synchronous and asynchronous activities, provides the broadest opportunities for interaction.
- Distance learning students need both technical orientation and help in establishing new communication protocols so that they feel comfortable with interaction.
- Instructors should consider using a mix of high- and low-tech solutions when incorporating interactivity into their distance learning courses.

CHAPTER FIVE

Institutional Guidance for the Distance Learner

Darcy Hardy, The University of Texas System

> *As a broader array of options becomes available, students will give more consideration to ease of access, cost, and timeliness of response in making their choice of a distance education provider. Quality student services will be the defining difference between distance education programs in the future.*
>
> University of Texas TeleCampus Master Plan

Chapter Overview

This chapter provides a basic design structure adapted to the needs of instructors working with students at a distance. It also focuses on strategic issues that are particularly important as you design effective learning experiences for your students. The following sections are included:

The Distance Learner and the Institution
Logistics: The Distance Learning Handbook
Academics: The Expanded Syllabus
Who is Responsible?
Summary: Guiding Principles

Introduction

The issue of student support in education has always been central to higher education success. When students enroll in traditional courses, they generally have access to services that will support their learning experience. These services may include admissions and registration, advising, counseling, bookstores, library services, and testing locations or centers. In other words, on-campus students typically receive a plethora of services to better prepare them for, and support them during their learning experiences.

On the other hand, students who enroll in a distance learning course may or may not receive any of the sponsoring institution's services. Even if they are eligible for traditional services, very few institutions currently provide most of these at a distance. Often the distance learning student is aware of the delivery mode of a course (the technology) but not of the complexities of the technology or the logistics associated with learning at a distance.

Burge and Howard (1988) conducted an attitudinal study involving experienced practitioners in the field of distance teaching. Overall, the respondents were positive regarding the importance of "learner-centered" education experiences, but noted that this focus had some disadvantages. The researchers also found that students should be encouraged to take responsibility for their progress in the course, which is something most students are not capable of doing right away. The researchers offer the following conclusion: "What does emerge from comments [in the surveys] is a recognition of the complexity of the educational process, in particular for distance education modes of delivery, and the knowledge that

responsibility in this enterprise is shared among all participants."

The Distance Learner

While it is true that students must be responsible for many of the issues facing them during their collegiate years, the distance learning student faces additional challenges. At a minimum, institutions and instructors can help these students by providing adequate information. Distance learning students often need a greater range of logistical and academic information than traditional students, yet are often offered less. By making such information easily available, institutions can facilitate student success and make their distance learning programs more attractive to potential students.

The demographic information gathered by Moore and Kearsley (1996) helps us to understand the learning styles and needs of many students who take a distance learning course. They report that distance learning students are primarily between the ages of 25 and 50, almost two-thirds are female, most are married, and the majority are working full-time while taking courses. This information, when combined with Knowles's (1978) principles of the adult learner, points to a learning environment that is closely related to the characteristics and principles of learner-centeredness, as identified by Brandes and Ginnis (Burge & Howard, 1988):

- The learner has full responsibility for his or her own learning.
- The subject matter has relevance and meaning for the learner.
- Involvement and participation are necessary for learning.
- The relationship between learners should show helping styles and learner responsibility.
- The instructor is a facilitator and resource person.
- The learner sees himself or herself differently as a result of the learning experience.
- The learner experiences confluence.

The adult distance learner generally relates to these principles and often demands that they are followed in the learning experience. The majority of distance learners align themselves with the above principles, but the institution may not always demonstrate an understanding of the needs of distance learning students. Many institutions fail to provide the support that is crucial to the success of the students in distance education settings.

In particular, many students feel that their institutions fail to provide opportunities for communication between themselves and the sending campus. The lack of communication can lead to a variety of problems including failure to complete the course, because students do not know whom to contact when technological problems occur or materials do not arrive on time. This type of service is often overlooked because it is often taken for granted in the face-to-face, traditional, on-campus environment.

Financial situations encountered by remote students can also be confusing. Many students who take a distance learning course are still required to pay activity, transportation, and student ID fees. In addition, students are often unaware of the financial aid options available to them. Many students are under the false impression that studying at a distance or enrolling

at multiple institutions would render them ineligible for financial aid.

Overall, trying to maneuver around in the institutional bureaucracy can be frustrating for any student, but especially for one studying at a distance. The amount of time and effort it may take the student to reach the desired department can be time-consuming. Or distance learning students may indeed find the right person to talk to, but then be treated as "second-class citizens" since they are not taking classes on campus. In a recent study, one student summarized these issues by stating that too much is assumed (by the sending institution) about life in the "virtual classroom." Instructors need to be aware of the special bureaucratic hurdles faced by their distance learning students, and do what they can to facilitate communication and help institutions to realize their responsibilities in the student support area.

It is almost a requirement that distance learning students be more focused and better time managers than students taking courses on campus, and that they be able to work both independently and as group members, depending on the delivery mode and location of the distance course. Other helpful characteristics include strong self-motivation, self-discipline, and assertiveness. Potential students need to know this before making the decision to enroll in a distance learning course, and institutions should be clear regarding what is expected of students in order to be successful in the distance learning environment. It remains important, however, to ensure that these students receive the kind of student support services received by traditional students, services that contribute to the overall success of the distance learning experience.

Logistics: The Distance Learning Handbook

One way that institutions can facilitate distance learning success is by simply making information available to distance learning students. A distance learning handbook for students explaining procedures and policies and offering contact information for different sorts of logistical difficulties can enable self-motivated students to take responsibility for their own success in the distance learning environment. Policies that normally apply to on-campus students may or may not apply to distance learning students. It is therefore critical to provide all relevant information to the students enrolled at a distance.

Such a handbook can be prepared by the institution as a whole or by individual departments offering distance courses. While its most obvious format is a printed text, in many cases it can be extremely valuable to offer the information in other media as well, such as in a distance learning Web site that online students can access whenever problems arise.

The handbook should provide basic information on options and procedures for admissions and registration, including deadlines, fees, and technical information on how to register at a distance. The handbook should also include a listing of the main campus schedule, including official drop dates and final exam schedules. A list of additional courses available by distance is helpful, as well as information on the recommended sequencing of courses for degree programs.

Instructors and staff contact information is critical to distance learning students. Since many

distance learning students may be unable to visit the main campus, they should be provided with phone numbers and e-mail addresses for instructors, teaching assistants, technical support personnel, the registrar, the computer-help desk, financial aid, and other important resources. If applicable, they should also have contact information regarding support services at remote sites.

Students also need to know how to deal with distance learning technologies. In addition to purely technical information on the use of equipment, an information piece that identifies appropriate ways to question a distance learning instructor and how to interact with the rest of the class should be provided. McHenry and Bozik (1995) concluded that interaction is a critical factor to the success of a learner–so institutions should try to remove barriers to interaction as much as possible by making sure students know what to expect ahead of time.

Finally, students need to know how to deal with visits to the main campus, where appropriate. Maps, names, and phone numbers would assist those students who are able to come to campus. Because distance learning students often feel a loss of connection with the main campus, efforts should be made to provide a more cohesive atmosphere in the distance learning environment. Information provided to on-campus students must be made available to distance learning students, either through a case-by-case approach or a network (e.g., videoconference, Web site, or listserv).

Academics: The Expanded Syllabus

Distance learning students enrolled in a particular course also need more information than a traditional syllabus provides. Cyrs and Smith (1990) suggest a "telesyllabus," an expanded syllabus that includes technical explanations as well as administrative data. Like the handbook, such a syllabus is most useful if it is made available on a Web site so students know where to access information when they need it.

A schedule of course topics and important dates and deadlines for homework assignments should be included in the syllabus. Also include administrative information on obtaining textbooks and other required materials, and examples of Web as well as traditional library sources. Students also need to know what is expected of them. The expanded syllabus can incorporate explanations of grading policies and other means of student evaluation.

Extensive information related to the technical aspects of the course should be included, such as trouble-shooting phone numbers. To encourage the most productive course interaction, distance learning instructors need to support the proper use of equipment so every student at each site may participate in class activities to the fullest.

Information concerning interaction in a distance learning course should also be provided. In the absence of traditional "office hours," it is extremely important to let students know how to contact instructors and teaching assistants with questions. Students should also know how to contact one another. Teachers can provide a list of telephone or e-mail contacts to enable students to work collaboratively.

In the past, student evaluations of distance learning instructors and courses have often been largely negative. Unfortunately, many times, distance learning students will take out their frustration with the institution on the instructor. It is therefore critical for instructors to be aware of the services available and to assist students with locating them. If the institution is not providing the necessary services, instructors should make an effort to inform appropriate staff at the institution of this problem. A few phone calls and meetings can make the experience much better for both instructors and students.

In addition, as distance learning options continue to proliferate, students will consider support services as well as academic quality when making their choice of a distance education provider. According to the University of Texas TeleCampus Master Plan, "Students in the near future will more strongly consider ease of access, cost, and timeliness of response in making their choice of a distance education provider as a broader array of options becomes available. Quality student services will be the defining difference between distance education programs in the future."

Although some institutions see the student as the person responsible for seeking out necessary support services, most students feel that it is the institution's responsibility to provide information, access, and other services. Furthermore, it is neither possible nor necessarily in the best interest of students or institutions to simply replicate on-campus experiences in smaller doses for the distance learning student. Instead, it is more appropriate to weave the successful distance education experience into the culture of the institution. All can then benefit from better access, greater flexibility, and a wider range of support services.

- Distance learners are often assertive, independent, self-disciplined, and motivated. Potential distance learners need to know ahead of time that these characteristics will help assure their success.
- Despite the self-motivation of many distance learners, institutions need to provide them with adequate information regarding the course.
- As a broader array of distance learning options becomes available, students will select institutions that provide them with the information they need to be successful.

Testing and Assessment at a Distance

Carolyn Jarmon, SUNY Empire State College

Chapter Overview
Introduction
Framework for Evaluation
Student and Instructor Success
Program Evaluation
Cost Evaluation
Summary: Guiding Principles

Introduction

As noted in Chapter One, an integral part of the distance learning course development process is the incorporation of measures of success. Students are very interested in knowing clearly what constitutes successful outcomes. Essentially, instructors of distance learning courses need to answer three basic evaluation questions:

- How will you know that students have been successful?
- How will students know that they have been successful?
- How will you know that you have been successful?

Answers to these questions generally fall into four categories:

- Evaluation of student and instructor success
- Evaluation of course materials and resources
- Evaluation of the technology and support services which surround the course
- Evaluation of the costs in terms of time and money

This chapter is organized around the evaluation of these four areas, with a focus on the three questions regarding student and instructor success. The evaluation process should be integrated throughout the course, not seen as a single measure at the end. This integration process is particularly important for distance learning students, in order to provide a wider range of information than might be needed from students in the traditional classroom. As noted earlier, working with students who are experiencing the course more independently requires frequent, useful evaluations. Students need feedback to ensure that they are not working hard in the wrong direction. Building in evaluation opportunities helps prevent such confusion.

Framework for Evaluation

The evaluation process includes three basic steps:

- Planning
- Collection of needed data
- Formative changes based on the findings

Planning is critical to the design and implementation of all distance learning courses. As noted earlier in this handbook, without good course planning, students may be set up for failure. Evaluation is an important step in that planning. Each category of evaluation should be included in the planning step, with feedback integrated into the course as quickly as possible.

Data may be collected in a variety of ways and may take either quantitative (numbers) or qualitative (words) form. Both types of data will provide useful information about how well students are learning, how well the course is working, and how closely related the costs and benefits are. Examples of data you can collect are noted for each evaluation below.

Formative change requires that you collect the appropriate data from all participating groups and interpret them in a useful fashion. Such change also requires that you plan for the evaluation activity to occur with outcomes you can implement. Thus, you cannot ask people if they like a particular facet of a course, but you must ask what they like and why it has been useful in their learning.

It is helpful at this point to mention another concept that is implied in this chapter. Success is a multidimensional idea. At the very minimum, success will be both affective (related to students' and your feelings about the experience) and cognitive (related to intellectual success, by both you and the students). Thus, while some people focus only on mastery of knowledge (the cognitive dimension), it is also important to consider the satisfaction or affective dimension of the learning experience. If students are working toward a degree, it is important that they develop a desire and motivation to learn. Thus, evaluating the affective component or satisfaction of the student becomes quite important. As instructors, most of us know that students liking a course does not necessarily equate with learning. On the other hand, liking a course certainly seems to facilitate the learning process. And if students do not like a course, it is useful to know this, and to know why they do not like it.

Student and Instructor Success

Measuring student and instructor success with the distance learning environment is the most common type of evaluation, and the type people think of first. As noted previously, designing a good distance learning course is an iterative process.

Planning

Link all evaluation of student learning to the initial course objectives.

The actual types of outcomes that you include must relate to the objectives that you established early in the planning stage. Some objectives will be cognitive; others will be attitudinal. Thus, the first step in determining success will be to focus on the objectives of the course.

Pivotal questions

- How will you know that students learned those concepts that are important?
- What data are necessary for you to be able to answer this question?
- What changes should occur based on the findings?

Student success measures should be tightly tied to the objectives and designed to collect the data identified as valuable in making an overall course evaluation. In a classroom situation, instructors frequently rely heavily on paper-and-pencil tests (quizzes, midterms, and exams). At a distance, such tests present special challenges apart from the content of the tests. The greatest concerns revolve around two issues:

- security regarding the test-taker–referred to as authentication
- security about the test material–cheating by using materials during a test

Authentication. Knowing that the person submitting the test is actually the person taking the test is important. Here are some useful strategies:

- *Proctored exams on campus.*
  If students live reasonably close, you can ask them to come to campus one or more times during the term for testing.
- *Proctored exams off campus.*
  If students live too far from campus, it is often possible to identify a responsible person to monitor the test. Sometimes instructors or student services offices at local colleges will be willing to provide supervision. Tests can be sent directly to the assisting institution and then returned to you by the proctor. Some instructors ask students to identify local people who can proctor exams (e.g., college personnel, clergy, or employers are possibilities). If a student is enrolled in an entire degree program, this person may be willing to continually serve as a proctor.
- *Include multiple methods of evaluation and communication to support the evaluation.*
  With multiple methods of evaluation and communication, instructors will be able to identify work that is not consistent with other assignments and conversations that have occurred. Instructors frequently report that they know their distance learning students better than they do those students who are part of a large lecture class. The evaluation plan should include a combination of evaluation activities that will provide sufficient opportunity for the student to demonstrate learning, and sufficient opportunities for the instructor to know that the work belongs to the student who is claiming it.

Prevention of cheating. The second issue of security relates to knowing that students are not using unauthorized materials during evaluations. Possible strategies include:

- *Minimize the use of tests designed to measure recall or facts.*
  Tests that focus on the recall of ideas, processes, or facts present opportunities for students to use resources. Using a variety of techniques that require analysis or application of ideas to new situations will help reduce cheating, because no direct source will be available. Experienced instructors who work with students at a distance find that using other types of evaluation experiences also solves this problem. Such measures may include essays, research papers, interviews, interactive Web-based exercises, case analyses, and problem solving. If proctored tests are possible, the issue of cheating is resolved, along with the issue of authentication.
- *Where feasible, consider several assessment options for each learning objective.*
  It is widely recognized that students have different learning styles. This variability is equally true of the wide range of students enrolled in distance learning courses. Thus, some students may respond well to one type of assessment, while others can demonstrate their learning more effectively with a different evaluation strategy. Where possible, it is useful to students to provide them with a choice of assessment options so that they can more effectively demonstrate to you what they have mastered.

Data collection

Evaluation of the student should also focus on how well the learning objectives, both affective and cognitive, have been achieved. Using a variety of evaluation activities is more likely to ensure that all of the learning objectives can be measured well.

- *Include both self-assessment and graded evaluations as data collecting instruments.*
  Students respond well to learning how they are doing and where they need to spend more time. Technology allows you to link specific content to specific learning outcomes that can be reviewed as often as necessary by students. Students will learn more and submit final assignments that are better, because they have had the opportunity to repeatedly work through the difficult parts.
- *Evaluate frequently.*
  Do not wait until the end of the course to collect data. Ask frequently for feedback, even if it is qualitative and brief. Provide students with two- or three-question check-ups, to collect information about specific assignments or module success.
- *Set up evaluation moments for yourself.*
  Take time consistently to reflect on how the course is going, from your perspective. Consider such issues as your time commitment, responses of students, ease of use of the materials, feedback from groups, timeliness and quality of work submitted, technology issues which have emerged, and any other factors which have given you or the students pause.

- *Keep a log or record of issues to change for next time.*
  Do not rely on your memory. Maintain a special file or group of notes about what you like and what you do not like about how the course is going. Some people tag ideas; others set up initial categories which they change later.

Include ideas that come from students such as new Web links or other possible resources for the future. The Web changes quickly, and having students provide you with their discoveries of possible resources can be extremely helpful.

Formative change

- *Where appropriate, make changes now.*
  Because technology permits much more flexibility, make changes as soon as possible, where reasonable and fair to others. Use the FAQ option or bulletin boards that can be updated to respond to concerns immediately.
- *Be open to trying new ideas and approaches.*
  Success with distance education involves using techniques that are not possible in the classroom. Some instructors have found that they need to provide greater freedom and variability in student activities than they might have once considered. The outcomes are often rewarding. As noted earlier, students at a distance may have a different array of resources and may need to approach assignments differently because of their resource base. They may identify resources which are not available to all students, but which are accessible from their particular location. The outcomes in learning, however, are usually just as good, and may be better. In addition, students who are good at surfing the Web often locate resources that are better than what the instructor has found. These resources can be shared with others in the group.

Program Evaluation

When considering program evaluation in a distance education setting, you are really trying to assess how effectively the resources and course materials have served your students.

Planning

- *Plan to provide a variety of resources and then be sure to gather information regarding the effectiveness of each one.*
  With distance learning students, it is frequently harder to determine which resources were used and which ones were particularly successful. Thus, again you need to include explicit opportunities for students to comment on the resources. Include short checklists or other assessment moments so that student can give feedback soon after they have used a particular resource, rather than waiting until the end of the course.

Data collection

- *Seek information about issues such as availability, cost, clarity, value, and ease of use.*
  With the technology-supported materials available today, it is important to know how difficult these are to obtain and use for students, whether their inclusion is

worth their cost, how understandable the resources are, and essentially whether students found any value in using these resources.

If you find that students had difficulty with particular components of the course, consider whether you need better up-front information or whether you should substitute other resources for those that proved less successful.

Formative change

- ***Think about the learning desired in the context of the resource issues that have been identified by students.***

  Changes in resources and course materials should flow from issues that have been identified. As the instructor of a distance learning course, it is often difficult to know exactly what issues students have faced. However, once identified, it is possible to make changes based on these insights.

Evaluation of Technology and Support Services

Planning

- Include information about technology needs up-front. Be sure that you are clear at the beginning about what technology is needed to be successful in the course, as noted in an earlier chapter, and then include in your evaluation questions or other opportunities for students to assess the success of the technology.
- Plan for information competency in your program so students learn to evaluate the information they gather using the Web and other resources. As noted earlier, information competency is pivotal in today's workplace. Students are increasingly able to find information, but less able to evaluate its usefulness and value. Include in your course specific tasks that assist students analyze information via tutorials or other framework options so that the information gathered is valuable and reliable.
- Identify student support structures up-front, and make students aware of these resources. Be sure that students have information about whom to contact and how, as well as what to expect in response time and type of assistance. Ask those who deliver support to keep a log of how frequently they assist one of your students so that you can know if your plans are used by your students.

Data collection

- Collect information about the mode of delivery used in your distance course. Find out how students responded to the type of technology used, the ease of access, the need for support, and the kinds of support services that were most useful. Ask about issues that were not resolved well, and seek student input as to how these might be done more effectively next time.
- Seek information about library resource difficulties. Because the range in availability of local resources is significant for students, it is important to understand what issues these students face. You can then think about possible solutions. For each course, collect information about what library issues they have faced and how they were resolved. Good ideas may emerge which can be used for students in another course.

- Collect information from those who provided technology support. Contact those who provided support to your students and ask them how much support students needed and about suggestions they might have to make the course proceed more smoothly.
- Assess how helpful tutorials and other support services are for students. If you have developed tutorials, or have used those developed by your college, ask students how helpful these were. Also seek information about areas in which new tutorials would be helpful.

Formative change

- Develop tutorials and other student service options that free students from technology-related difficulties, and that increase their attention to the focus of the course. If you identify problem areas, implement solutions as quickly as possible. Such barriers distract the student and consume needed study time in nonproductive ways. It is sometimes difficult to anticipate these until the class has been taught at least once. Where possible, of course, anticipate these needs and plan for them at the outset.
- Refine institutional materials (Web pages, hardcopies) for greater consistency in information. Students become more accomplished distance learners if the institution is able to provide consistent, reliable support services. Instructors can contribute to an institutional presence that increases student success and reduces instructor time and effort in providing the needed information.

Cost Evaluation

Planning

- ***Establish processes to keep track of the time, money, and other resources used during the course development and delivery.***

  Knowing what the costs of a distance learning course are will make evaluation easier. A strategy for collecting data needs to be planed for at the beginning. Establish logs and lists that will facilitate the collection of data during the course.

Data collection

- ***Ask students to keep track of their time and money allocations for the course.***

  As noted previously, student satisfaction will partly result from a course that allows them to focus on the course content and learning outcomes. Thus, it is useful to know how much time was spent on noncourse content-related activities. For example, how much time they spent just trying to get a plug-in to work or learning about spreadsheets, when the focus of the course was not on such issues.
- ***Keep records regarding your time and how it was spent.***

  Instructors who teach distance learning courses frequently indicate that it takes more time to teach these courses than to teach a classroom-based or traditional course. It is valuable to know where your time goes (what activities take the most time) so you can seek or develop strategies to minimize time allocations where possible.

Formative change

- *Identify and experiment with strategies to save time.*
  More experienced instructors have developed effective strategies to manage e-mail and to reduce the time they spend on managing the technology. Some strategies were offered in Chapters One and Four.

Instructors have increasingly found that a well-designed record keeping or student tracking system can be a major asset in establishing time efficiencies. If records are automatically generated based on student progress through a course, instructors can quickly identify those students who are having difficulty with the content or who may be less adept at working independently and need some motivation and/or assistance.

Some instructors are also establishing e-mail notes that are automatically sent to students who have not participated or who have not done well on a particular assignment. These notes provide contact from the instructor and motivation for the students. Such notes can also be designed to let students know they are doing a good job and are right on-target with the work they are doing.

- *Where feasible, develop strategies for reducing the cost of delivering the instruction.*
  Know how your institution is paying for the technology so that you can minimize the costs without decreasing the learning environment. Be alert to the costs in time of adding another student to the course, and to the methods of reducing time costs, so that adding another student is possible if needed. Be alert to trade-offs between increased workload and opportunities to use the technology's capabilities to assist you.

For example, while it is handy to have textbooks onsite, it may be more cost-effective to ship these to students and bill them. Also some resources can be posted on the Web, if needed, rather than providing everyone with a hardcopy.

Summary: Guiding Principles

- Effective evaluation requires planning, data collection, and formative change.
- Effective evaluation includes four types:
  - Student and instructor achievement
  - Course materials and resources
  - Technology and support services
  - Costs in time and money
- Effective evaluation must include all of the participants in the course–the students, the instructor, the support personnel from student services, and the technology help desks.
- Effective delivery of distance learning requires that all parties find the experience positive and have input into the changes considered for the next offering.
- Include multiple methods of evaluation, both graded and self-assessment, and multiple methods of communication to support the evaluation.
- Evaluate frequently.
- Where appropriate, make changes immediately.

- Be open to trying new ideas from students and others involved in the process.
- Seek information about issues such as availability, cost, clarity, value, and ease of use.

A Systems Approach to Asynchronous Distance Learning

A Community College Model

Betty Elliott, Rio Salado College

Chapter Overview

This chapter offers a profile of the distance learning model of one innovative and experienced college without boundaries. It shares the lessons learned from 20 years of experience at this institution in delivering distance education using a variety of technologies, profiles the distance learner population and instructors involved in distance learning, highlights fundamental student and instructional factors for success, and outlines key functions in a systems approach to distance learning. The following sections are included in this chapter:

Profile of a College Without Boundaries
Fundamental Questions
Principles for Building Successful Distance Learning Programs
Summary: Guiding Principles

Introduction

A successful distance learning initiative is driven by the needs of everyone who participates in it. This self-evident principle is deceptively simple. That is, to operationalize it, every single distance learning objective must be examined from the point of view of everyone involved in the program, from the instructor and the student learner to those who will be called upon to support or assist them. Thus, a systems approach calls for identifying and addressing every major factor required for the student, the instructors, and the institution to achieve success. It also means understanding the special implications of each instructional medium for teaching and for learning successfully at a distance.

Although it is certainly a significant factor, the curriculum alone does not account for the success of the distance learning program. The quality of student interaction with both the instructor and the institution makes the experience either a success with endless potential or a costly failure. How that "quality" is defined derives from recognizing that everyone involved in the distance learning program is, in some sense, a consumer whose roles and needs must be satisfactorily addressed.

Profile of a College Without Boundaries

Rio Salado College, headquartered in the Phoenix metropolitan area, is one of the ten Maricopa Community Colleges, the nation's largest multi-college district. Rio Salado College was established in 1978 to provide educational opportunities for adults throughout Maricopa County, but unlike other colleges in the district, Rio does not have a traditional campus. Rio's desire to make an affordable, high quality college education available to working adults led to

the development of a college without boundaries. In place of a traditional campus, Rio uses existing facilities such as high schools, libraries, community centers, and computer labs located throughout the Phoenix metropolitan area. Currently, we offer classes at more than 200 locations throughout the county, including public schools, churches, businesses and shopping malls at locations convenient to working students.

In addition, Rio uses a variety of distance learning formats to deliver educational opportunities wherever people live and work. For more than 20 years we have been using the latest technology to reach our students, offering television, audio and video cassette, print-based, conference call, video conferencing, and computer conference courses, as well as traditional classes. Our "Flex Start" distance learning courses let students begin many of these courses 26 times a year.

Distance learning students are successful at Rio Salado because of the strong support systems we offer. The "Beep-A-Tutor" program offers help with homework and provides answers to questions via the telephone. We also offer individual tutoring and online tutoring via the Internet. Our Internet program includes a "Cybrary," a complete library in cyberspace including access to newspapers and magazines; "OWL", an on-line writing lab complete with dictionary and thesaurus; and a student chat area, where students can help and support each other. Through these unique and comprehensive programs, Rio Salado College has gained a national reputation for excellence and innovation. Even more importantly, we have won the appreciation of our students, the employers we serve in business and industry, and community agencies that request our classes.

Fundamental Questions

Building a systems approach requires answers to five key questions:

- What is distance learning?
- Who are the institution's primary distance learners?
- What are the characteristics and needs of distance learners?
- Who are the distance learning instructors and what are their basic needs and roles?
- What fundamental factors influence success in distance learning?

"Right" answers, of course, depend on numerous variables and differ for each institution. The important task is creating and maintaining a system for helping all distance learning participants achieve their goals, and for responding promptly when technological, pedagogical, marketplace, and other forces create the need for change.

Question One: ***What is distance learning?***

There is a myriad of answers to this complex question. However, all types of distance learning generally fall into two categories. One is synchronous, meaning that although the learning may take place in a variety of settings, the time is fixed. The other is asynchronous that means learning can take place any time, anywhere, and at any pace. Rio Salado College has focused primarily on developing and delivering asynchronous courses in mixed media, print based, CD-ROM, and Internet-based formats.

Question Two: ***Who are the institution's primary distance learners?***

Rio Salado College's distance learning students mirror the national distance learning population. Statistically, our more than 7,000 distance learners look like this:

- 72% are female
- 53% are between 21 and 35 years of age
- 33% are between 36 and 50 years of age
- 63% are employed full time
- 83% are pursuing a degree

These are busy people living full lives. Their education is a personal priority, and for several reasons, distance learning works well for them. Most are juggling too many balls to take courses comfortably in a traditional setting. Meeting fixed schedules and commuting to and from a campus or satellite facility simply are not acceptable options. Most of these students bring a distinct set of desires, learning traits, and personality characteristics to the encounter, and they often have specific goals in mind.

Question Three: ***What are the characteristics and needs of distance learners?***

At Rio Salado College we find that many of our distance learners are capable, highly motivated students who require high-quality content and instructors who provide good facilitation, encouragement, and intellectual guidance. In addition to technical assistance, these students also require student services that support and integrate them into the college's environment.

Our most successful distance learning students share several key characteristics:

- ***Goal oriented***. Many want specific job-related courses and all expect to get their money's worth from the college.
- ***Highly motivated***. They are self-directed learners with good reading and time management skills, and they are willing to work independently.
- ***Focused learners***. They are learners who often enroll for the pure joy of learning.
- ***Risk-takers***. They are willing to try new ways of learning.
- ***Thrive when guided and encouraged by their instructors***. They do best when they are integrated into the institution's social and support structures and given personal mentoring.

We have found that these characteristics mesh well with the realities of distance learning, which require students to manage their own learning process. Not only must distance learners be more assertive, but there is a higher expectation that each student will participate actively in their courses. In traditional classrooms, students can hide out and be relatively passive. The demands of distance learning, however, are such that students who want to learn must participate in order to do so.

In our experience, successful distance learning students take greater responsibility for their learning than traditional students. These busy learners are often motivated to learn by their

personal career aspirations. Because of the demands of their busy schedules, they have to be initiators in order to get things done. At the same time, we have found that many of these learners are somewhat uncertain as they venture into the world of distance learning, and they require encouragement, referrals, and intellectual guidance from their instructors. Many underestimate their abilities and report being afraid of the challenges in distance learning. These needs of distance learners have clear implications for instructors who wish to enable student success.

In addition, we find that it is important for instructors to take account of students' individual circumstances as they affect the learning experience. A single mother of three who has a full-time job and is taking two other work-related classes might find it a little more stressful to wait for a call back from her instructor than a retiree who is enrolled for the sheer fun of learning.

Question Four: ***Who are the distance learning instructors and what are their basic needs and roles?***

Rio Salado College operates on the assumption that to deliver quality distance learning you must hire instructors who have content expertise and either the appropriate skills for teaching at a distance or a strong desire to acquire them. To find instructors with these attributes, Rio conducts monthly interviews in the areas of general education, business, government, the professions, and certain trade and vocational fields. In all, Rio selects and trains more than 200 new distance learning instructors annually and maintains a pool of approximately 1,000 qualified instructors across all disciplines.

It is critical in a quality distance learning program that the institution helps instructors prepare for the different roles that will be required of them. Just as there are different learning styles, there are different teaching styles. Depending on the medium involved, the transition to distance learning can challenge instructors to develop entirely new instructional approaches. For instance, since much of the content in distance learning is delivered by writing instead of speaking, the institution must provide resources to help instructors make that very demanding transition. Instructors who might be master teachers in the classroom are not inherently prepared to teach effectively when face-to-face instruction is out of the question. Another factor that may present a challenge for some instructors is the use of new technologies. Such considerations require forethought and preparation.

Our experience has shown that distance learning instructors take on new roles that are dictated by both the nature of the distance environment and the characteristics of the distance learner. These instructors not only are a content resource, but they also are a mentor, coach, facilitator, and referral service. Our most successful distance learning instructors know that they must be aware of the distance learner's probable misgivings about the experience and its challenges. They recognize, for example, that using a warm, inviting tone in course content and communication materials encourages student connections and learning and that building in early assessments, prompt intervention, stress management tips, and linkages to student support services in their courses leads to student success.

Although all instruction depends to some extent upon utilizing clear and timely assessments, distance makes the instructor's skill at both assessing students' needs and communicating effectively important factors in student success. Here, as in the classroom, the instructor must utilize several types of assessment, including exercises, quizzes, and examinations. However, new communicating skills might be required for giving customized feedback in writing to a highly motivated but technically challenged learner, or for facilitating a Web search or a chat-room discussion among several students. In these ways, the distance factor makes the instructor both a teacher and a partner in students' learning.

The fact that these students are at some distance from the institution by no means alleviates their need for the full array of student services and supports. This can mean that instructors are called upon to play an unfamiliar role as a resource supplier, a tutor, and/or a referral liaison.

Question Five:

What fundamental factors influence success in distance learning?

So far, we have indicated that the institution must equip its instructors for new roles and functions, and that instructors' skills in assessing needs, communicating feedback, and mastering new media are important factors in students' success. In addition, we can say with certainty that involvement by the whole college is required to implement a successful distance learning program. The entire institution will be called on to support the instructors, the learners, and those who assist them.

Principles for Building Successful Distance Learning Programs

From our 20 years of experience, we have distilled several principles for building distance learning programs, developing student learning strategies and interventions, and encouraging the retention of distance learners. These principles fall into six broad categories:

- Systems Approach
- Instructor Support
- Student Support
- Student Retention
- Technical Support
- Course Support

Systems Approach

Rio Salado College has worked to become a learning organization. Those who are involved in our distance learning program place a premium on learning. In addition, we continually evaluate our experiences and strive to translate learning and experiences into knowledge that is disseminated to the entire organization.

A system is a whole whose elements work together–continuously affecting each other–to achieve a common purpose. Structuring our distance learning program using a systems model fits well with the learning organization concept. A systems approach helps the entire college capture the learning of each of its parts, and is a major benefit when the time for significant change arrives. That is, when the functions involved in distance learning are seen systemically, we are better able to see clearly how every influence affects each function, and how each function is dependent on the other, and plan accordingly.

In a nutshell, Rio's success stems from recognizing early on that distance learning on this scale requires a huge commitment of resources, infrastructure, planning, and management. As noted, we have learned that providing quality distance learning entails satisfying the needs of not one, but two kinds of consumers: the distance learner, and everyone involved in delivering distance learning. As a result of this learning, the Development Team and Course Development Department were established.

In 1994, a Development Team comprised of one adjunct instructor, seven full-time instructors, and eight administrators was created to manage the tremendous growth in Rio's distance learning program. The team meets weekly to resolve operational issues and to explore new pedagogy and technology. They encourage discussion about technology, teaching and learning, and team members talk candidly about all aspects of the program–delivery, support, development, and so on. Its specific function is to plan, develop policy, communicate, and troubleshoot the distance learning operation. Its chief goals are to bring productive innovations in technology and best practices to distance learning as well as to stimulate organizational learning.

In 1996, the dean of instruction formed a Course Development Department, with a mission of designing a comprehensive course development process for new and revised distance learning courses. Specifically, the department is responsible for ensuring quality, consistency, and efficiency in both process and product by using a team approach. Course development is considered a contributing factor for the distance learning system. Once a course is approved, numerous logistics must be coordinated and essential services must be made available. Course development requires about 2.5 months for content development and 1 month for implementing the course.

The department has three components: instruction, technology, and operations. Instruction includes instructor developers and departmental chairs who facilitate the conceptual development of the learning materials. Technology is responsible for "packaging" the content in deliverable formats and for developing and maintaining the network infrastructure that runs distance learning programs. Operations is the administrative arm, and includes staff members who coordinate resources and oversee production of print and mixed media course materials, as well as editors and pilot testers who prepare the course content for delivery.

Instructor Support

As noted, the assumption at Rio Salado College is that its distance learning program has several consumers. Students, of course, are the primary external consumers. In addition, instructors are viewed as its primary internal consumers, and as noted, these instructors require many kinds of support if they are to develop, deliver, and facilitate high quality distance learning courses successfully. Everyone who participates in delivering instruction or intervention must receive critical support and be trained to meet the needs and understand the characteristics of the distance learning student.

Rio provides all its distance learning instructors with orientation to the college's policies, procedures, and services, as well as to its culture. Monthly training sessions are conducted that cover new roles, distance learning content delivery techniques, new learning technologies,

best practice guidelines, and other technical skills. In addition, Rio provides ongoing in-service and discipline-specific continuing education for both our adjunct and tenured instructors.

Student Support

One of our chief insights is that if the distance program really is to be an anytime, anyplace conduit for learning, then certain essential student services must be equally accessible from a distance as on campus. This insight, in a way, transforms the distance learner into the distant student, and requires the institution to adopt a customer service systems approach to meet students' needs.

Rio Salado College's student services department is responsible for providing these and other typical student services:

- General information
- Academic advisement and counseling
- Career counseling assistance
- Academic support, such as online conferencing (cybertutors), and tutoring accessed though an innovative Beep-a-Tutor system
- An online bookstore
- An online library, referred to as our "cybrary"
- Online registration
- Online financial aid
- Online linkage to request special services for students with documented disabilities
- Online proctoring requests and exam scheduling

We believe that without these supports, most distance learners cannot hope to navigate today's complex higher education enterprise. Therefore, the college is committed to providing them.

Student Retention

Rio Salado College also operates from the principle that if an institution of higher learning is to achieve its maximum growth potential in the twenty-first century, it must retain its students. The philosophy at Rio is that the more our students are integrated into the institution's support systems, the likelier they will be retained. Therefore, we find it essential to provide thorough, timely orientation as well as personalized social integration and learning support services such as the following:

- In-person, video and audio orientations
- Personal welcome letters
- Peer and mentor phone calls throughout the learning encounter
- Personal contact from the instructor at the time of the first assignment
- Contact from student support service providers when indicated
- Computer conferencing and Internet chat rooms
- Guidance about using distance technologies and technology help desks
- Guidance in the areas of time management, study strategies, stress management, and goal setting

A number of programs have been created to provide these critical support services. For example, Rio's student services department has developed a telephone contact program, whereby staff members contact first time distance learning students during several key points in the semester. Another example is the pool of telephone support callers who contact Internet users one week after the start of their class to ascertain the status of the student.

Technology Support

Everyone involved in developing, delivering, and consuming distance learning has to have access to technology and technical expertise. Rio Salado College meets these needs in several ways. Instructors receive training and comprehensive support in computer use and Web course development, among other things. In addition, five information services (IS) teams support the distance learning effort at Rio: Help Desk (technical issues), Networking (connection issues), User Support (hardware and software user issues), Programming (functionality issues), and Audio/Video support (interactive support issues).

Course Support

Course Support provides introductory materials to students so they can begin their courses.

- Welcome letter
- Labels
- Course information booklet
- Testing brochure

Course Support provides instructors with the materials they need to communicate with students (mailing materials such as stamps, labels, and envelopes), and they record and submit grades. This work is intensified by the fact that this information is distributed every two weeks to accommodate the 26 start dates. Course Support also handles student calls concerning course-related issues such as course materials. Lastly, they maintain a database application that is tied to the Student Information System. This database allows for numerous focus reports that are used for decision making by the administration and college leadership.

Summary: Guiding Principles

We have found that distance learning requires a massive array of carefully coordinated services for both internal and external consumers. These services must be orchestrated by a systems approach. The following principles guide Rio Salado College's systems approach:

- Systems thinking states that the performance of a system depends on the performance of its parts and on how the parts interact with each other to affect the performance of the whole. Rio Salado College believes it takes a college to deliver a course.

- Rio Salado College has built in a mechanism for continuous improvement. We began with the basics and continue to correct our mistakes and improve the product.

- Student-centered instruction is the goal. This can be achieved by moving from a model where instructors designs all assignments to one where students have choices in assignments. Our ultimate goal is a model where students design their own assignments.

- It is not enough to have courses online; you must also provide traditional student services and the specific kinds of supports needed by distance learners.

- At the heart of our approach is the Development Team. This team not only handles planning, development of policy, communicating, and troubleshooting functions, but also provides a conduit for continual innovation.

Mary Boaz
Interim Director
Murray State University
Harry L. Crisp, Sr. Regional Higher Education Campus

Currently Boaz manages the Regional Higher Education Campus in Paducah, Kentucky, which is a branch campus located 50 miles from the main campus. The facility includes 20,000 square feet of office and classroom space which houses eight traditional classrooms, two interactive television classrooms, and a Learning Resource Center. In the eight years since Boaz joined the Paducah Center, ten academic degrees have been developed and implemented as extended campus degrees, with an average semester of 32 classes enrolling 400 students.

Since 1990, Boaz has also had a major role in implementing MSU's Interactive Television program, growing from the initial two sites to over twenty sites in the local network. She co-developed and implemented an ITV summer institute for teachers, and continues to be the primary trainer for instructors teaching on the ITV system.

Boaz also serves on the Editorial Advisory Board of Distance Education Report as well as the Paducah Area Chamber of Commerce. Her work has been published in New Directions of Teaching and Learning and Distance Education Report, and she was awarded the 1995-1996 Division of Telecommunications Distinguished Service award of the University Continuing Education Association.

Betty Elliott
Associate Dean of Instruction
Rio Salado College

Betty Elliott is a 25-year employee of the Maricopa Community College District. She received her B.A. degree in biology, M.A. in counseling, and, at the time of this writing, is working on her doctoral degree. She has held several positions for Maricopa ranging from the Physical Science Lab Technician at Mesa Community College to Director of Student Activities and Services at South Mountain Community College. Elliott began her career at Rio Salado College as the Director of Learning Assistance and Disability Resources and Services. She has served as the Associate Dean of Student Services and is currently the Associate Dean of Instruction.

Don R. Foshee
President, Innovative Interactions, Inc. (i3)
Project Manager and Acting CIO, Western Governors University (WGU)

A recognized pioneer in his field for two decades, Don Foshee has designed, built, and managed some of the largest and most successful distance learning, training, and telemedicine networks in the U.S., all utilizing a wide range of technologies. He has designed and directed distance learning networks in Texas, North Carolina, Illinois, Alabama, West Virginia, and

Mississippi, as well as a Native American Network for the Bureau of Indian Affairs. All these projects are successfully operating today, integrating satellite, computers, the Internet, ITFS, online services, digital compression, microwave, video and audio conferencing, wireless, and cable TV distribution.

In 1992, Foshee returned to the private sector, and as Director of Strategic Programs for VTEL Corporation, built its first vertical divisions for education and government applications, products, and services. Today, as President and CEO of Innovative Interactions, Inc. (i3), headquartered in Austin, TX, Foshee provides a wide range of consulting services for technology planning, network and environmental design, training, legislative policy, grants, public speaking, project management, and applications development worldwide. i3 clients range from small colleges and K-12 schools, to large university systems, state governments, health care providers, and multinational corporations. He was recently named Project Manager and CIO for the largest "virtual" university project in the world, the Western Governors University (WGU).

Foshee has also served as President of the U.S. Distance Learning Association (USDLA) and as Founder and President of the Texas Distance Learning Association (TxDLA). He has also been instrumental in the formation of statewide organizations in Texas, Illinois, Washington D.C., Georgia, Colorado, Louisiana, as well as international associations in Venezuela and the Caribbean Island nations. He has resided, or currently sits, on boards of the USDLA, TxDLA, ITCA, NETO, EDSAT, NUTN, Texas T-STAR, and Leukemia Society of America, has written for over twenty publications, and is currently completing a book of practical guidelines for new communications environments.

Darcy Hardy
Director
UT TeleCampus
The University of Texas System

Darcy Hardy is Director of the UT TeleCampus, a unit of the University of Texas System designed to support distance delivery of academic programs from all UT component institutions. Hardy served as Project Leader for the development of the Master Plan that led to the creation of the UT TeleCampus. Prior to her current position, Hardy was Assistant Director for Distance Education at the Center for Instructional Technologies at The University of Texas at Austin. She also served for seven years as Director of the UT TeleLearning Center in the Division of Continuing Education at the Austin campus.

Hardy has been involved in distance education since 1989, and has participated in the design, development, delivery, and evaluation of programs delivered via print, audio, computer, and/or video. She is immediate past president of the Texas Distance Learning Association and is a commissioner in the University Continuing Education Association. Hardy also serves on the Instructional Telecommunications Advisory Committee for the Texas Higher Education Coordinating Board.

In 1996, Hardy was selected for inclusion in Who's Who in Distance Education. Two of her recent publications, "Motion Curricula and Non-Motion Curricula in Distance Education: Technology Selection Reconsidered," and "Audio Teleconferencing and the Adult Learner: Strategies for Effective Practice" were selected for Recommended Reading for Distance Education Students by the University Continuing Education Association. Other honors include the 1998 UCEA Norbert Williams Up-and-Coming Leadership award and the 1998 TxDLA Don Foshee Leadership award.

Carolyn Jarmon
1996-1998 Educom Visiting Fellow
SUNY Empire State College

Carolyn Jarmon is the Acting Assistant Vice President for Academic Affairs at SUNY Empire State College in Saratoga Springs, New York. During the preparation of this handbook, Jarmon was the 1996-98 Educom Visiting Fellow, working with member institutions on such issues as redesigning learning environments to reach new student audiences in a cost-effective way. Jarmon has worked in the field of distance education for a number of years. Her background includes curriculum design and delivery of asynchronous, computer mediated learning at both the undergraduate and graduate levels. She was co-director of SUNY by Satellite, a statewide program to deliver an undergraduate business degree on community college campuses. She earned a Ph.D. and M.S. from Cornell University, an M.B.A. from East Tennessee State University, and a B.S. from the University of Delaware.

Don Olcott, Jr.
Associate Dean
Academic Programs and Distance Learning
Extended University
The University of Arizona

Don Olcott, Jr. has recently joined the University of Arizona's Extended University as Associate Dean for Academic Programs and Distance Learning. Olcott oversees EU's credit programs, which include Evening Weekend Campus, Correspondence Study, Video Campus, Extension Education, and summer and winter sessions. Prior to this position, Olcott directed the Western Interstate Commission for Higher Education's (WICHE) Institute for the Management of Distance Education and served as manager for institutional services with the Western Cooperative for Educational Telecommunications.

Recognized as a leader in the field of continuing and distance education, Olcott has served in a variety of instructor and administrative positions at Oregon State University, The University of Missouri-Columbia, and Western Washington University. He was the 1994 recipient of the University Continuing Education Association's Adelle F. Robertson Professional Continuing Educator award for outstanding leadership, scholarship, and contributions to the field of continuing and distance education. He was also the 1997 recipient of UCEA's, Noflett Williams Leadership award for outstanding leadership in the field of distance education.

Olcott is a graduate of Harvard University's Institute for the Management of Lifelong Learning, has published extensively in the areas of institutional and instructors support systems for distance education, and has served as a consultant to colleges and universities across the country. He currently serves on the editorial staff of *The American Journal of Distance Education*. Olcott received his bachelor's and master's degrees from Western Washington University in European History and student personnel administration, respectively, and his doctorate in higher education administration from Oregon State University.

Olcott was the 1998 recipient of the Charles Wedemeyer Outstanding Distance Education Practitioner award in North America. Given by the University of Wisconsin-Madison in concert with its annual Distance Teaching and Learning conference, the award recognizes an outstanding practitioner who has provided exemplary leadership and meritorious service to the field in North America.

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ADEC Distance Education Consortium

ADEC is an international consortium of state and land grant institutions providing economic distance education programs and services.
Web site: http://www.adec.edu/

Archipelago Productions - Distance Education Resources

Archipelago supports distance learning with course support materials and resources. The distance learning resources outlined on this Web page have been carefully selected and organized by an advisory board of academic consultants to promote thoughtful consideration of distance teaching and learning.
Web site: http://www.archipelago.com/resources/index.html

California Virtual University

California Virtual University "ties together the online and distance education offerings of every accredited college and university in California." You can search by subject area or by institution.
Web site: http://www.california.edu/
Web site: http://www.fcae.nova.edu/disted/

PBS Adult Learning Service

PBS Adult Learning Service provides national coordination, distribution, and promotion of telecourses. This Web page branches into sections for educators and for students. The educators' section includes selections for programming and other resources, an instructors referral network, a satellite feed calendar, and information about their publications.
Web site: http://www.pbs.org/learn/als/

Resources for Distance Education

Resources for Distance Education by Charles Darling, provides lists of resources for distance education including online discussion/newsgroups and links to other distance education resources.
Web site: http://Webster.commnet.edu/HP/pages/darling/distance.htm

The Sloan Center for Asynchronous Learning Environments (SCALE)

The Sloan Center for Asynchronous Learning Environments (SCALE) was established in March 1995 with a grant from the Alfred P. Sloan Foundation. SCALE in .ructors are participating in a three-year project of restructuring undergraduate courses to integrate various techniques associated with asynchronous learning networks (ALN). The goals of this project are to create efficiencies in the educational process (cost, time, and instructor productivity), increase student retention, and decrease time-to-degree.
Web site: http://w3.scale.uiuc.edu/scale/

United States Distance Learning Association (USDLA)

United States Distance Learning Association (USDLA) is a non-profit association whose purpose is to promote the development and application of distance learning for education and training. Of particular interest is their distance learning section, which includes a fact sheet and a link to statistics about distance learning.
Web site: http://www.usdla.org/

University of Idaho Engineering Outreach

In order to help teachers, administrators, facilitators, and students understand distance education, Dr. Barry Willis, the Engineering Outreach Director and his staff have developed the Distance Education at a Glance series of guides. Further use of the guides as well as links to them may be approved by Engineering Outreach Administration.
Web site: www.uidaho.edu/evo/distglan.html

University of Texas at Austin

McManus, T. "Delivering Instruction on the World Wide Web." University of Texas at Austin. 1996.
Web site: http://www.ccwf.cc.utexas.edu/~mcmanus/wbi.html

Western Cooperative for Educational Telecommunications

Established in 1989 by the Western Interstate Commission for Higher Education (WICHE), this membership-based organization is open to providers and users of educational telecommunications. The Western Cooperative facilitates resource sharing, information sharing, and policy advocacy in the use of educational technologies and telecommunications. In addition to ordering information for print publications, this site offers exceptional online resources including Principles of Good Practice for Electronically Offered Academic Degree and Certificate Programs, Best Practices in Implementation of Advanced Educational Technologies, and a Glossary of Telecommunications Terms.
Web site: http://www.wiche.edu/telecom/telecom.htm

Western Governors University (WGU)

This site offers distance learning courses from dozens of colleges, universities, and corporations across the United States (and soon the world!). Courses offered through WGU are all distance learning courses and use both high-tech and low-tech ways–from the Internet to satellite to the postal service–to provide students with a variety of options for learning.
Web site: http://www.wgu.edu

World Lecture Hall (WLH)

World Lecture Hall (WLH) gives links to instructors' Web pages, usually in the form of syllabi, for courses that use the Web to deliver class materials. Some courses are complete distance learning courses; others are supplemental materials for on-campus courses. The links are sorted in alphabetical order by course subject.
Web site: http://www.utexas.edu/world/lecture/

The following sites can be used by students to gauge their readiness to participate in a distance learning course.

http://www.washingtononline.org

www.ccconline.org/index.real?place=ForMe

http://www.flcampus.org/ (click on "learning links," click on "Is Distance learning for You?"

Broward Community College - Open College Readiness Self-Test (http://fs.broward.cc.fl.us/dtc/aa/ocindex.html)

St. Petersburg Junior College - Online Self Assessment (http://instcomp.spjc.cc.fl.us/troy/selfassess.htm)

http://www.dce.unr.edu/istudy/quiz.htm

http://www.sln.suny.edu/admin/sln/original.nsf (click on "Distance Learning Calculator")

http://eli.tlc.cc.va.us/eliforme.htm

http://www.cce.edcc.edu/online/selfassess.html (click on "Is distance learning for you?")

http://www.wgu.edu/wgu/self_assessment.asp

http://muskingum.edu/~cal/database/Database.html

http://www.howtolearn.com/personal.html

http://snow.utoronto.ca/Learn2/tsscale.htm

http://www.geocities.com/~mathskills/brain.htm

http://alliance.franklin.edu/t-ready_self-eval.html

Analog A wave form system for recording audio or video. Compare with digital.

Applet Java program that is referenced in a Web page and is downloaded to a user that accesses the Web page. The downloaded program is run inside the user's browser.

Architecture The structure of a Web page or a computer program.

ASCII (American Standard Code for Information Interchange) - Plain text characters. ASCII is the standard, unformatted 256-character set of letters and numbers. An ASCII file is a text file that can be read by almost any program.

Asynchronous An adjective describing an operation performed at any time and in the background, independent of other simultaneous processes. Asynchronous messages can be started at any time and are marked with start and stop bits.

ATM (Asynchronous Transmission Mode) - A multiplexed information transfer technique of sending data in irregular time intervals using a code such as ASCII. ATM allows most modern computers to easily communicate with one another.

Audio conferencing A synchronous meeting of two or more persons residing in separate locations, utilizing two way audio technology (e.g., a standard telephone line).

Backward compatibility Means that a file made with a newer version of a program can be read with an older version. The opposite, upward compatibility, is more common.

Bandwidth An expression of the capacity of an electronic conduit to carry information. Generally speaking, the faster the speed, the better the performance. Bandwidth is measured in file size/second.

BBS (Bulletin Board Service) - A type of electronic bulletin board that may be a single computer with a modem, or a local network of many computers, that can accept dozens of simultaneous connections. A BBS often features downloadable files and discussion areas.

BCC (Blind Carbon Copy) - In e-mail, this means that a duplicate message is sent to a recipient who is not recorded in the header of the original message. See CC (carbon copy).

Binary A Mac-compatible file compression method. Sometimes PCs require special programs in order to decode binary files, which have a .bin file name extension.

.bin File name extension for a file that has been compressed via the binary method. See Binary.

BinHex A Mac-compatible file compression method, which adds the file name extension .hqx to the file name. Some PCs need special programs to decode these files. Sometimes BinHexed files are also compressed with the binary (.bin) method, yielding a double file name extension: .bin.hqx.

bit An acronym for BInary digiT. It is the basic unit of information in the machine world. A bit is a digit in binary form and carries one of two values, 0 or 1.

bps (Bits Per Second) - A measurement of data transmission speed.

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Bug An error in the source code of a software program. To free a program from a bug is to debug.

Byte A single computer character, generally eight bits. For example, the letter "G" in binary code is 01000111.

Cache Small, fast memory that stores frequently used or recently accessed data. Pronounced "cash," from the French cacher, to hide. Caching does not help when Web sites change frequently the cached version will not be updated.

CBI Computer-based instruction.

CBT Computer-based training.

CC In e-mail, a CC is a duplicate message sent to recipients in addition to the primary one.

CD-ROM Stands for Compact Disc-Read Only Memory.

CGI (Common Gateway Interface) - An interface between a Web site and a user. It allows forms, surveys, and other documents to be filled online. The results are automatically sent to the Web site's server.

Chat session Allows multiple users to converse via message posting synchronously on different channels. Usually each channel is devoted to a different subject.

Compression A way of making text, data, or images take up less space in order to shorten data transfer time. Compression is carried out by any one of many compression standards: JPEG, JBIG, MPEG, GIF, TIFF, PICT, ZIP.

Connectivity The state of having Web or Internet accessibility. If you are able to browse the Internet from your computer, you have "connectivity."

Cross-platform Compatible with both Mac and Windows operating systems (platforms).

DAT (Digital Audio Tape) - Pronounced "dat." A high-quality audio recording and storage medium developed by Sony in the mid-1980s.

Data rate The speed at which files and/or bits of information may be transferred over an electronic connection.

Digital A binary system for recording video, audio, or other types of information, i.e., 010101.

Digital Video Interactive (DVI) - A format for recording digital video onto compact discs allowing for compression and full motion video.

Disc As in compact disc, videodisc, laserdisc. When spelled with a "k," it refers to a floppy or hard storage disk coated with a magnetic material to which you can add digital data.

Distance learning Instructor and students are separated by physical distance where technology (i.e., voice, video, data, and print) is used to bridge the instructional gap. It can be a combination of both synchronous (real-time) and asynchronous instruction, the former often involving a remote

location. Technological options available in distance learning include audio, video, data (including computers, e-mail, and the Web), and print.

Distributed learning — Any learning based on the use of technology that takes place outside of the classroom, be it on- or off-campus. Distributed learning may use a wide range of technologies (i.e., Web, e-mail, video conferencing, simulations, newsgroups, distribution lists, chat rooms, and instructional software), and is often supplemental to a course taught in the classroom.

Document exchange — The ability to share documents for group collaboration. Special software is required for this functionality.

Domain name — The name of an electronic network associated with an organization (e.g., harvard.edu, archipelago.com). Do not confuse with IP address. One domain might include hundreds of machines, each with an individual IP address.

Downloadable — A file which can be copied from a server on the Internet to a local hard drive.

E-mail — Electronic mail. Enables users to send and receive text transmissions and digital files. Special software and an Internet or Intranet connection are required to send/receive e-mail messages.

EPS — (Encapsulated Post Script) - A type of file format.

.exe — File name extension for PC, self-extracting, downloadable files.

Firewall — A "wall" of software that keeps unauthorized users or intruders from entering a specific network.

Frames — Independent content areas of a Web page.

FTP — (File Transfer Protocol) - The Internet's file transfer system that enables users to transfer files between systems and to distribute information on request to Internet users.

Full-motion video — Signal that allows transmission of broadcast quality video.

Fully interactive video — Two-way interactive video. Two sites interact synchronously with audio and video as if they were co-located.

Functionality — The things an object, program, feature, or concept can do.

Hit — A noun. Technically, a client computer's request for an image or file from a Web server.

.hqx — File name extension to a file that has been compressed via the BinHex method. See BinHex.

Host — Any machine running a process that other computers can interact with. Accordingly, any computer running server or client software qualifies literally as a host. The term is most often used in reference to an Internet service provider's core computer system which "hosts" its customers' and guests' processes.

HTML — (HyperText Markup Language) - The standard computer language used to format documentation for publishing on the Web. HTML documents are text files with extra commands, called tags, embedded in them.

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HTTP (HyperText Transport Protocol). The protocol used for passing hypertext documents on the Web. HTTP has become popular because of its somewhat simple nature and the fact that you can easily write both client and server programs that can communicate with HTTP.

Hypertext/hyperlink A system of coding text that links electronic documents. When reading a hypertext document, you can quickly jump forward and backward between linked documents. Hypertext enables you to organize the information you read into different formats.

Interactive The user is able to access portions of the media or information at will and at their own pace. Often implies user input that causes changes in media.

Interface The points of contact between a user and the computer program, i.e., the buttons, slider bars, and navigation schemes the user must work with to direct the program.

Internet A global network that enables users to exchange electronic information (text, audio, video, still images, etc.).

Intranet The result of an organization's use of e-mail and Web technologies to create their own internal [protected] networks.

IP (Internet protocol address) - The numeric address, such as 206.221.206.188, of a specific machine on a network. Often confused with domain name.

ISDN (Integrated Services Digital Network) - A set of digital telecommunication standards that transmit voice, video, and data over standard phone lines at up to 128 Kbps. About 71/2 times faster than a 14.4-Kbps modem. Offered by regional phone companies, it is the quickest and easiest way to increase bandwidth in the home.

ISP (Internet Service Provider) - A company or organization that provides subscribers with Internet connectivity.

Java A programming language developed by Sun Microsystems. Java is an object-oriented programming language with many features, including multimedia support and platform independence.

Javascript A way to write a Java program by using a unique scripting language.

LAN (Local Area Network) - A network of computers that are all in the same location, such as an office, dormitory, or on-campus computer lab.

Listserv A specific, commonly used version of mail-handling software that lets people subscribe and unsubscribe to mailing lists. Many listserv mailing lists also enable you to retrieve files related to the mailing list.

Mailing list A generic system of duplicating one electronic message and sending it to many people. A single letter is sent to the mailing list host, and a copy of that letter is then sent to every person on the list.

Media Any discrete file-movie, sound, picture-to be displayed or heard on a computer screen.

Modem (MOdulate DEModulate) - Hardware that allows computers to interact with each other via telephone lines by converting digital signals to analog for transmission along analog lines.

MPEG (Moving Pictures Experts Group) - A standard for compressing sound and movie files for downloading or streaming (see streaming audio) across the Internet. There are two standards: MPEG-1, which delivers video and sound data at roughly the same speed as a single-speed CD-ROM drive, producing shaky, indistinct video, far worse than television quality, and MPEG-2, which is a dramatic improvement, and can be shown at near-laserdisc clarity with a CD-quality audio track.

Multimedia Any presentation that utilizes two or more types of media (i.e., video, audio, text, still images) to communicate information.

Network A series of computers that are interconnected, allowing their users to share electronic information. Networks can be public (the Internet) or private (LANs, WANs, Intranets).

Non-traditional student A non-traditional student may be described in a variety of ways–a distance learner, returning student, or as a participant in distributed learning. Typically non-traditional students at the college level are older, more self-motivated individuals, as compared to traditional students.

PICT A file format for graphics (still images).

Pixel The shortened form of "picture element," for the dots that make up an image or character on a computer screen. The more pixels, the better the resolution.

Platform The type of hardware or operating system of a computer, i.e., Mac or Windows.

Plug-in An additional piece of software code that adds functionality to a larger software program.

Push Generic term meaning that the technology "pushes" media to you (or your desktop). This contrasts to "pull" technology, such as the Web. Trademarked versions of push technology include Pointcast, Castanet, and Active Desktop.

Queue The designated area in which data enters a computer, is sequenced, and dispatched.

QuickTime (QT) - A video and animation technology developed by Apple, which is located in the operating system and is used by most Mac applications that include video or animation. It has become the de facto standard for storing, transporting, and playing back multimedia files.

RAM (Random Access Memory) - A computer's short-term memory and the route to improved computing performance. It takes around 10,000 times longer to read from disk than from memory.

.rtf File name extension for rich text format file.

Real-time No lag time, no processing time. See synchronous.

Server A computer or hard drive dedicated to storing information that is on a network and provides services to other computers, known as clients.

.sit The file name extension of a file that has been decompressed with StuffIt Expander.

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Source code The HTML tags that are used to build a Web page. More generally, the programming language used to create documents or pages for the Internet. The source code is "compiled" into binary or machine-readable files.

Streaming audio A method of transmitting audio files over a network. The most popular software packages that use streaming audio are RealAudio and Liquid Audio. Using MPEG compression technology, it remains the best way to bring workable, widely available multimedia content to the Web. It has made Internet radio and broadcast (Webcasting) possible.

Synchronous An adjective describing an operation performed at the same time as another event. Telephone conversations are synchronous; voice-mail messages are asynchronous.

T1 A high-speed network link that transmits data at 1.5 Mbps, thousands of times the speed of a 28.8 Kbps modem It is the Porsche of Internet connections. A T2 is a bundle of four T1s, used mainly by cellular phone companies. A T3 is faster than either a T1 or a T2 line.

TCP/IP (Transmission Control Protocol/Internet Protocol) - This is the mother tongue of the Internet. It is the agreed-upon set of computer communications standards that enables communication between different types of Internet-connected computers and networks. Other Internet protocols, such as FTP or PPP, run on top of technology-based environment.

Telnet A protocol that enables users to connect their computer to other Internet-connected computer systems and make use of resources on those remote machines.

Threaded discussion A discussion engine which allows for a continuous string of participants' comments on a topic.

TIFF (Tagged Image File Format) - Usually used with Windows machines, although it can be Mac compatible as well.

Traditional student At the college-level, a traditional undergraduate student is typically involved in on-campus courses, meeting in a classroom at regularly scheduled times. These students are usually between the ages of 17 and 24.

Two-way video Usually synchronous transmission of video data from one location to another. These transmissions may be one-to-one or one-to-many off-site locations.

Upload The outbound transfer of file data from your local computer.

URL (Uniform Resource Locator) - An object's unique address on the Internet, be it a Web page, the graphics that appear on it, or any discrete file that can be viewed or downloaded via the Internet. URLs generally take this form: type of server followed by a colon and the Internet path to the file.

User Users are people. It's the term for the "he," she," or "they" working at a computer.

video conference A synchronous meeting of two or more persons residing in separate locations, utilizing two-way video technology (e.g., satellite transmission).

WAN (Wide Area Network) - see network

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